

AIRS
Atmospheric Infrared Sounder

AIRS Version 3.0 Processing Files Description



June 2003
Version 1.0



Jet Propulsion Laboratory
California Institute of Technology
Pasadena, California

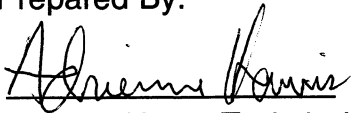
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AIRS
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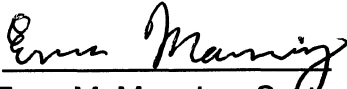
AIRS Version 3.0 Processing Files Description

Prepared By:



Adrienne Harris, Technical Writer
AIRS Science Processing System

Approved By:



Evan M. Manning, System Engineer
AIRS Science Processing System



Steven Z. Friedman, Project Element Manager
AIRS Science Processing System



Jet Propulsion Laboratory
California Institute of Technology
Pasadena, California

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1 Introduction

1.1 Purpose

This document describes the released product files for the Version 3.0.4.0 (V3.0.4.0) delivery of the AIRS Science Processing System (ASPS). These products incorporate data from the AIRS, AMSU-A (AMSU-A1 + AMSU-A2) and HSB instruments.

1.2 Processing Overview

Figure 1 shows the ASPS top-level architecture. ASPS science data will be processed at the following levels:

- Level 1A (data conversion)
- Level 1B (calibration)
- Level 2 (retrievals)

In Level 1A data is unpacked and geolocated; engineering quantities are converted to physical units.

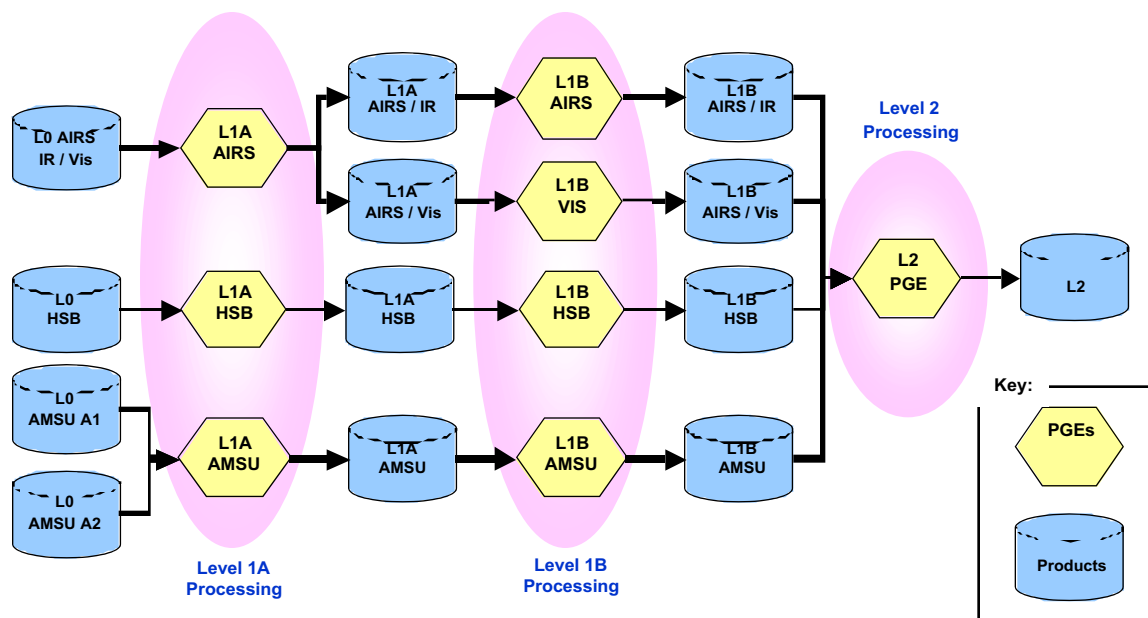


Figure 1. ASPS Top-Level Architecture

Level 1A processing requires Level 0 AIRS raw data packets, AMSU-A raw data packets, and HSB raw data packets as input data from the EDOS, plus ancillary data and configuration files from the archive. Output products, in the form of HDF swath files that contain unpacked raw science data numbers (DN), are produced for archival and input to Level 1B.

In Level 1B science data is converted to physical units.

Level 1B processing requires Level 1A DN data (output from Level 1A processing) as input data, plus ancillary data and configuration files from the archive. The Level 1B output products are produced for archival and input to Level 2. These products contain calibrated radiances in the form of HDF swath files.

Each L1B science file type contains calibrated radiances from 6 minutes of observations. The corresponding QA subset files exclude radiances and other large fields to deliver QA in a compact format.

Data from the AIRS instrument is divided into separate products: AIRIBRAD has infrared data, while AIRVBRAD has Vis/NIR data.

AIRS IR and Vis/NIR radiances are in radiance units, while MW instrument data AIRABRAD and AIRHBRAD are in brightness temperature units.

In Level 2 atmospheric and surface quantities are estimated from the Level 1B data.

Level 2 retrieval processing requires Level 1B data (output from Level 1B processing) as input data, plus ancillary data and configuration files from the archive. Output data, in the form of cloud-cleared radiances and atmospheric parameters, are produced for archival. Each instrument has an associated Product Generation Executive (PGE) for Level 1A and Level 1B data processing, where AIRS and Vis have separate PGEs for Level 1B. The Level 1A products are collected into granules of data. Each granule is comprised of 45 scansets (six minutes of instrument data). A scanset is defined as one scanline of the AMSU instrument, three scanlines of the AIRS instrument, and three scanlines of the HSB instrument. The Level 1B PGEs read the granules of Level 1A data and perform calibration processing of engineering units to produce granules of calibrated Level 1B products. The Level 2 PGE reads corresponding data from all instruments and produces atmospheric retrieval (Level 2) products.

Figure 2 shows the Browse, Match-up and Vegetation Map PGEs. Figures 3 and 4 show the ASPS PGE data flow, including the Radiosonde Observation (RaObs) Match-up PGE, the Browse PGEs, and the Vegetation Map PGEs.

The RaObs Match-Up PGE extracts Level 1B and Level 2 data that matches ground truth measurement locations.

The RaObs process requires 10 hours' worth of the following:

- Level1B HSB and AMSU and AIRS and Vis
- Level 2 standard and cloud-cleared AIRS products
- Radiosonde observations
- Aviation Forecasts

The Daily Browse PGEs produce summary global images for selected products. Each requires one day's worth (240 granules) of a given Level 1B or Level 2 product.

The Vegetation Map PGEs produce single-day and multi-day maps of inferred surface reflectivity in Vis/NIR wavelengths.

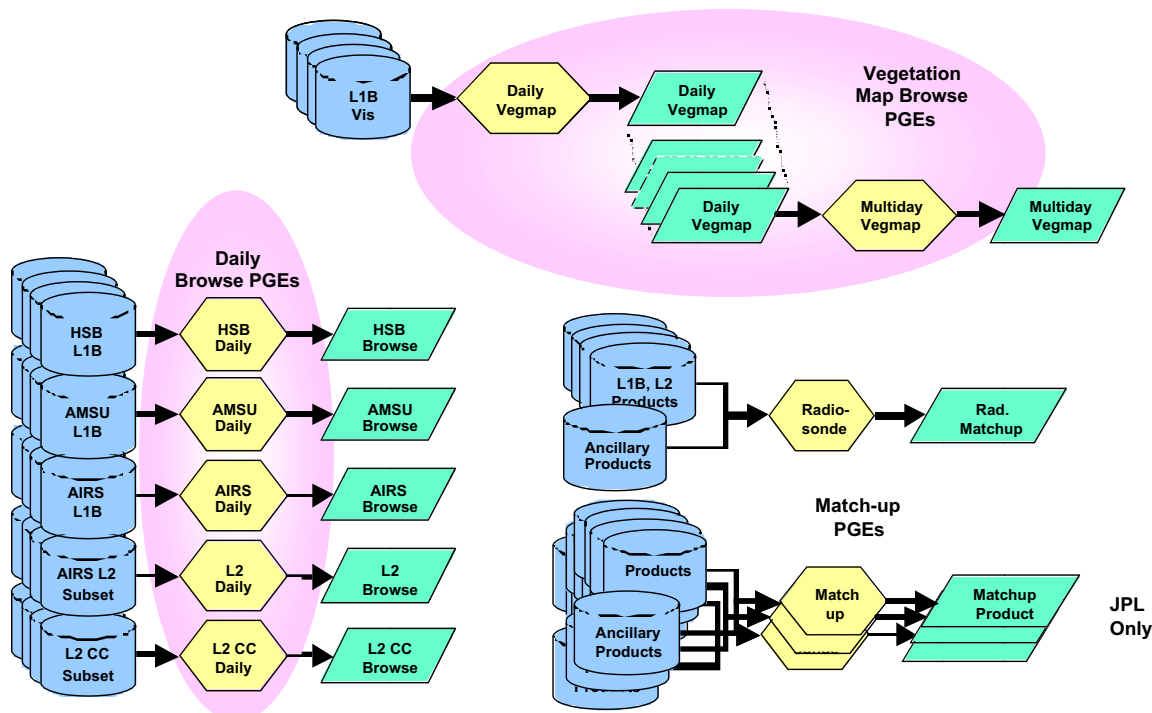


Figure 2. Browse, Match-up and Vegetation Map PGEs

The daily Vegetation Map PGE requires one day of Level 1B Visible granules (240 granules).

The multi-day Vegetation Map PGE requires multiple days (currently 10) of daily vegetation maps.

The processing of AIRS science data at the various levels will be accomplished by using Process Control Files (PCFs) to point to the staged input and output files, including ancillary files, used by the science software during execution. Files are described in Appendix C by ESDT short name, file name, PCF identifier, file description, and other information.

The external data sets, used by the ASPS (but not produced by the ASPS) for the production of AIRS products, are input data and ancillary data. Input data, in the form of Level 0 AIRS raw data packets, AMSU-A1 and AMSU-A2 raw data packets, and HSB raw data packets, are available from the EDOS. Ancillary data, including PCF templates and configuration files, are included in the V3.0.4.0 delivery and will be available at run time at the DAAC, having been staged from the archive.

This architecture is designed and built for processing of ASPS data at the GSFC DAAC. The ASPS PGEs are activated, based on availability of data, by the ECS SDPS scheduling capability. Production rules, specifying the exact activation sequence of the ASPS PGEs, are generated by the ASPS development personnel and are delivered to the GDAAC (see ICD, Appendix A). The GDAAC engineering staff uses the production rules to set up the ECS scheduling system.

Dynamic ancillary data will be available from the DAAC archive as follows:

- attitude and ephemeris
- aviation forecasts (AVN)
- Radiosonde observations (PREPQC)
- Carryout files

AIRS products are archived at the GSFC DAAC archive. These product formats are defined in the product interface specifications, provided in Appendix A.

The basic product, QA and browse subset file types are shown in Table 1.

Table 1. Product, QA and Browse Subset File Types

| <i>ESDT Shortname</i> | <i>Mnemonic Name</i> |
|------------------------------|--|
| <i>AIRIASCI</i> | L1A_AIRS_Science |
| <i>AIRIACAL</i> | L1A_AIRS_Calibration |
| <i>AIRBAQAP</i> | L1A_AIRS_QA_Subset |
| <i>AIRVASCI</i> | L1A_VIS_Science |
| <i>AIRVACAL</i> | L1A_VIS_Calibration |
| <i>AIRAASCI</i> | L1A_AMSU |
| <i>AIRHASCI</i> | L1A_HSB |
| <i>AIRIBRAD</i> | L1B_AIRS_SCIENCE |
| <i>AIRIBQAP</i> | L1B_AIRS_QA |
| <i>AIRIBCBS</i> | L1B_AIRS_Browse_Subset |
| <i>AIRVBRAD</i> | L1B_VIS_SCIENCE |
| <i>AIRVBQAP</i> | L1B_VIS_QA |
| <i>AIRABRAD</i> | L1B_AMSU_SCIENCE |
| <i>AIRHBRAD</i> | L1B_HSB_SCIENCE |
| <i>AIRX2RET</i> | L2_Standard_atmospheric&surface_product |
| <i>AIRI2CCF</i> | L2_Standard_cloud-cleared_radiance_product |
| <i>AIRX2SUP</i> | L2_Support_atmospheric&surface_product |
| <i>AIRX2RBS</i> | L2_Ret_Browse_Subset |
| <i>AIRI2CBS</i> | L2_CC_Browse_Subset |

1.3 Applicable Documents

AIRS Version 2.7 Processing Files Description, JPL D-25941, March 2003

AIRS Version 2.5.1 Processing Files Description, JPL D-20001, September 2002

Interface Control Document between the Earth Science Data and Information System (ESDIS) and the AIRS Science Processing Systems (ASPS), Earth Science Data and Information System Project Number 423-42-07, JPL D-22992, February 2002

Operations Agreement (OA) between the Goddard Space Flight Center (GSFC) Distributed Active Archive Center (DAAC) and the AIRS Team Leader Science Computing Facility (TLSCF), JPL D-23045, January 2002

AIRS Science Processing System Software Development Methodology, JPL D-18573, February 19, 2000

AIRS Product Generation System (PGS) Version 2.1 Requirements and Design Document, JPL D-19556, January 2001

AIRS Product Generation System (PGS) Version 1.5 Requirements and Design Document, JPL D-18926, January 2001

AIRS Product Generation System (PGS) Version 1 Requirements and Design Document (Preliminary), JPL D-17851, Version 1.1, July 1999

AIRS Version 2.0 System Description Document, Version 2.0, JPL D-19557, August 2000

AIRS Science Software Integration and Test Procedures and Agreement with the Goddard Distributed Active Archive Center, JPL D-16791, Version 3, Revision 2.0, June 1, 2000

AIRS Product Generation System (PGS) Prototype 8 Requirements and Design Document (Preliminary), JPL D-16451, Version 1.0, December 1998

AIRS Data Processing and Instrument Operations (DPIO) Software Requirements Document, JPL D-16785, Version 1.0, April 3, 1998

1.4 Acronyms

| | |
|--------|--|
| AIRS | Atmospheric Infrared Sounder |
| AMSU-A | Advanced Microwave Sounding Unit - Version A (AMSU-A1 and AMSU-A2) |
| APID | Application Process Identifier |
| ASPS | AIRS Science Processing System |
| AVN | Aviation (Global Forecast System Model) |
| BRTEMP | Brightness Temperature |
| DAAC | Distributed Active Archive Center |
| DECOM | Decommutation |
| DN | Data Number |
| DPIO | Data Processing and Instrument Operations |
| ECS | EOSDIS Core System |
| EDOS | EOS Data Operations Service |
| EMOS | EOS Mission Operations System |
| ENG | Engineering |
| EOS | Earth Observing System |
| ESDIS | Earth Science and Data Information System |
| ESDT | Earth Science Data Type |
| GCM | General Circulation Model |
| GRIB | GRIdded Binary |
| GSFC | Goddard Space Flight Center |
| HSB | Humidity Sounder for Brazil |
| HDF | Hierarchical Data Format |
| ICD | Interface Control Document |

| | |
|-------|--|
| IR | Infrared |
| L1A | Level 1A |
| L1B | Level 1B |
| L2 | Level 2 |
| LGID | Local Granule ID |
| LID | Logical ID |
| MW | Microwave |
| NCEP | National Centers for Environmental Prediction |
| NDVI | Normalized Differential Vegetation Index |
| NIR | Near Infrared |
| NOAA | National Oceanic and Atmospheric Administration |
| NWS | National Weather Service |
| OA | Operations Agreement |
| PCF | Process Control File |
| PDS | Product Description Section (NCEP Office Note 388 (ON388)) |
| PGE | Product Generation Executive |
| PGS | Product Generation System |
| PSA | Product Specific Attributes |
| QA | Quality Assessment |
| SCF | Science Computing Facility |
| SDPS | Science and Data Processing Segment |
| SPS | Science Processing System |
| SSI&T | Science Software Integration and Test |
| TAI | Universal Atomic Time |
| TLSCF | Team Leader Science Computing Facility |
| UR | Universal Reference |
| UTC | Coordinated Universal Time |
| Vis | Visible |
| WMO | World Meteorological Organization |

AIRS Science Processing System Data Flow Diagram (1 of 2)

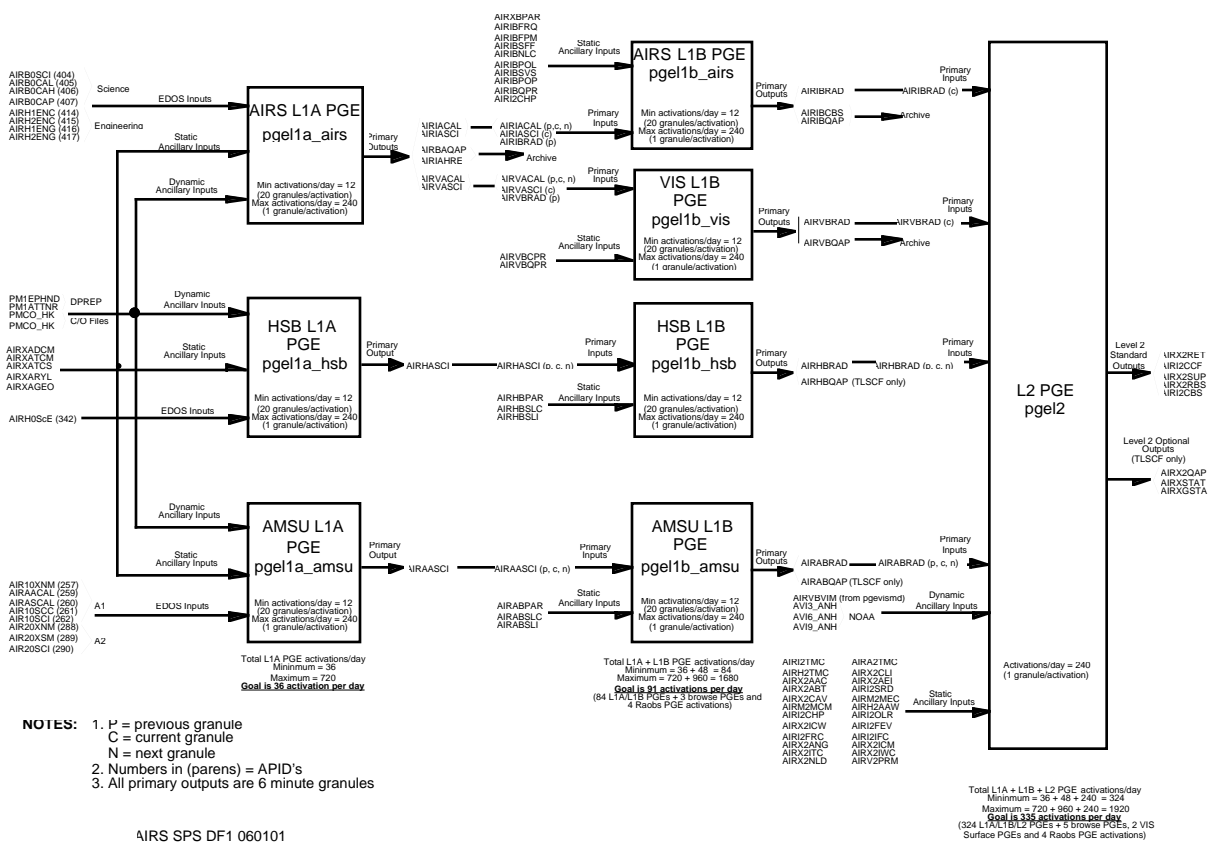
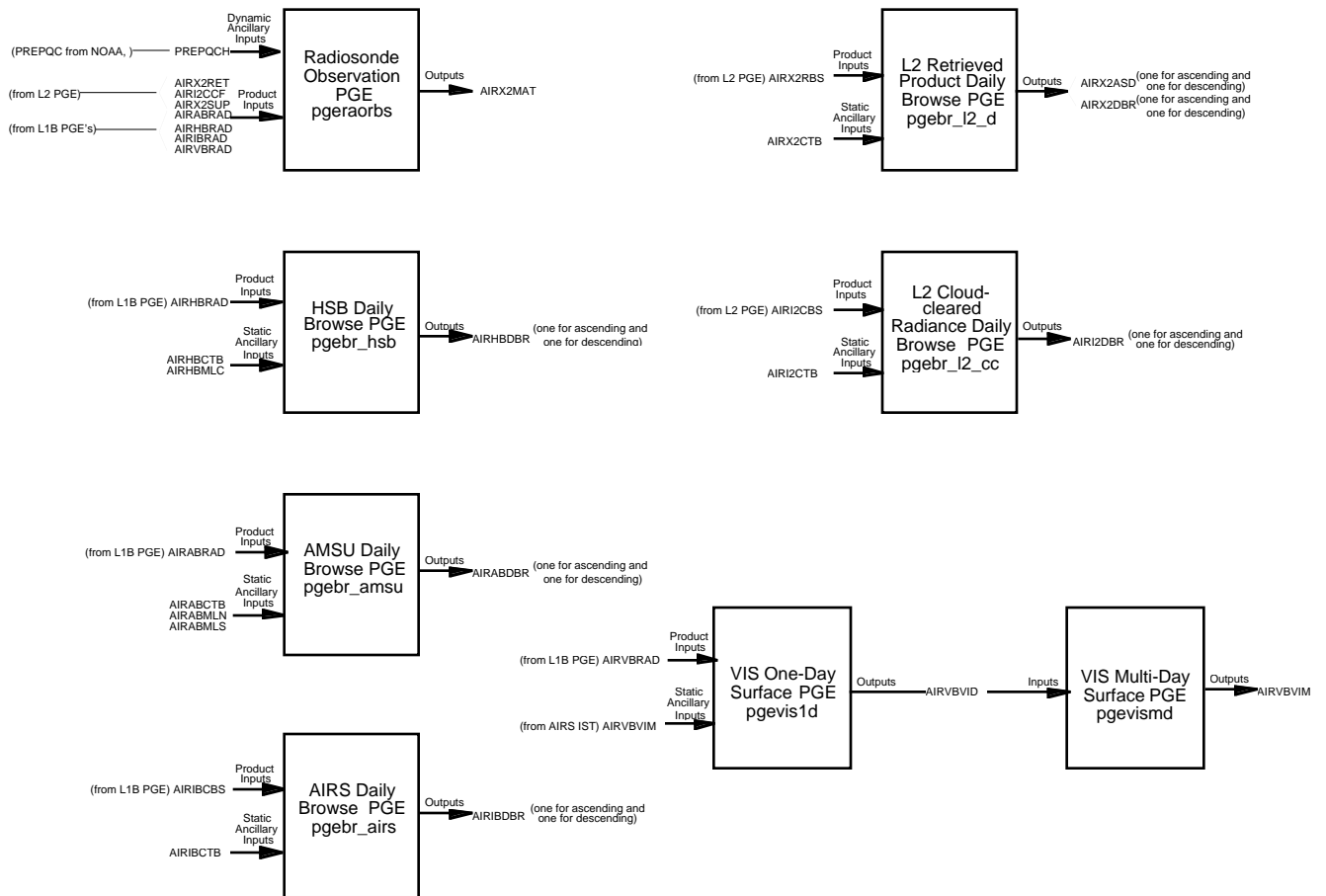


Figure 3. ASPS L1A, L1B and L2 PGE Data Flow Diagram

AIRS Science Processing System Data Flow Diagram (2 of 2)



NOTES:

1. Each PGE is run once per day (1 activation per day) except for pgeraorbs which is run 4X per day with each input 101 files (10 hours worth)
2. Each input required from a L1B or L2 PGE is 240 files (or a full days worth of data) except for pgevismd which inputs several days worth of AIRVBVID and pgeraorbs which inputs 101 files (10 hours worth)
3. Diagrams reflect inputs and outputs for V2.1

AIRS SPS DF2 053101

Figure 4. ASPS Radiosonde, Browse and Vegetation Map PGE Data Flow Diagram

Appendix A1. Single-Swath Fixed-Format Product Interface Specifications

These products have exactly one swath per file. The swath name is given in the interface specification as "Swath Name."

All dimensions, geolocation fields, fields and attributes have names exactly corresponding to the contents of the "Name" column of the appropriate table, including underscores and capitalization.

The "Explanation" information, as provided in the product interface specifications, is a guide for users of the data and is not included the product files.

The contents of the "Type" column of the attribute and field tables can either specify a standard HDF type or a special AIRS type. The standard HDF types used by AIRS are:

- string of 8-bit characters (Attributes only)
- 8-bit integer
- 8-bit unsigned integer
- 16-bit integer
- 16-bit unsigned integer
- 32-bit integer
- 32-bit unsigned integer
- 32-bit floating-point
- 64-bit floating-point

For all 16-bit or longer fields the value -9999 is used to flag bad data. Special AIRS types are like structures, with the fields specified in tables as discussed below.

The first table of the interface specification lists "Dimensions" which are the HDF-EOS swath dimensions. The names "GeoTrack" and "GeoXTrack" have a special meaning for this document: "GeoTrack" is understood to be the dimension along the path of the spacecraft, and "GeoXTrack" is the dimension across the spacecraft track, starting on the left looking forward along the spacecraft track. There may also be a second across-track dimension "CalXTrack," equivalent to "GeoXTrack," except that "CalXTrack" refers to the number of calibration footprints per scanline.

"GeoTrack" will vary, depending on the size of the data set being tested. For nominal 6-minute data sets, it will be 45 for large-spot products (AMSU-A, Level-2, cloud-cleared AIRS) and 135 for small-spot products (AIRS, Vis/NIR, HSB). All other dimensions will remain fixed at the values specified in the product interface specification.

These files contain no geolocation mappings or indexed mappings.

The second table specifies "geolocation fields." These are all 64-bit floating-point fields that give the location of the data in space and time. If the note before the table specifies that these fields appear once per scanline then they have the single dimension "GeoTrack." Otherwise, they appear once per footprint per scanline and have dimensions "GeoTrack,GeoXTrack."

The third table specifies "Attributes." These are fields that appear only once per granule. Many of them are attributes in the HDF-EOS Swath sense, but those with something other than "None" under "Extra Dimensions" are HDF-EOS swath fields with the listed dimensions.

The fourth table specifies "Along-Track Data Fields." These are fields that occur once for every scanline. These fields have dimension "GeoTrack" before any "Extra Dimensions." So an "Along-Track Data Field" with "Extra Dimensions" of "None" has dimensions "GeoTrack"; whereas, if the "Extra Dimensions" is "SpaceXTrack (= 4)," then it has dimensions "GeoTrack,SpaceXTrack."

The fifth table specifies "Full Swath Data Fields." These are fields that occur once for every footprint of every scanline. These have dimensions "GeoTrack,GeoXTrack" before any "Extra Dimensions." So a "Full Swath Data Field" with "Extra Dimensions" of "None" has dimensions "GeoTrack,GeoXTrack"; whereas, if the "Extra Dimensions" is "Channel (= 2378)," then it has dimensions "GeoTrack,GeoXTrack,Channel."

There may be an additional table called "Calibration Swath Data Fields" which specifies all the fields that occur once for every calibration footprint of every scanline. These fields have dimensions "GeoTrack,CalXTrack" before any "Extra Dimensions." So a "Calibration Swath Data Field" with "Extra Dimensions" of "None" has dimensions "GeoTrack,CalXTrack"; whereas, if "Extra Dimensions" is "Channel (= 15)," then it has dimensions "GeoTrack,CalXTrack,Channel."

The last section of the interface specification contains a table for "Special AIRS Types." These special AIRS types are used as "shorthand" for groups of fields, listed in the "Attributes," "Along-Track Data Fields" and "Full Swath Data Fields" tables as single fields. If the name of a special AIRS type appears in the "Type" column of one of these tables in place of a standard type, then there are really as many fields as there are rows in the corresponding type table, each with a name made up of the "Name" from the upper table followed by a "." and the "Field Name" from the lower table.

For example, consider a field in the "Attributes" table named "apid_415_cnt" of type "AIRS Engineering Packet Counts" (See Appendix A4.). If the table for "AIRS Engineering Packet Counts" under "Special AIRS Types" lists the three fields "missing_in," "missing_ends" and "good," then the swath contains the three fields "apid_415_cnt.missing_in," "apid_415_cnt.missing_ends," and "apid_415_cnt.good."

A1-1. L1A AIRS Science Interface Specification

Interface Specification Version 3.0.4.0
2003-05-19

ESDT ShortName = "AIRIASCI"

Swath Name = "L1A_AIRS_Science"

Level = "level1A"

Footprints = 90

scanlines per scanset = 3

Dimensions

These fields define all dimensions that can be used for HDF-EOS swath fields.

The names "GeoTrack" and "GeoXTrack" have a special meaning for this document: "Cross-Track" data fields have a hidden dimension of "GeoXTrack"; "Along-Track" data fields have a hidden dimension of "GeoTrack"; "Full Swath Data Fields" have hidden dimensions of both "GeoTrack" and "GeoXTrack".

| Name | Value | Explanation |
|-----------|--------------------------|---|
| GeoXTrack | 90 | Dimension across track for footprint positions. Same as number of footprints per scanline. -- starting at the left and increasing towards the right as you look along the satellite's path |
| GeoTrack | # of scan lines in swath | Dimension along track for footprint positions. Same as number of scanlines in granule. Parallel to the satellite's path, increasing with time. (Nominally 45 for Level-2, AMSU-A, and AIRS/Vis low-rate engineering; 135 for AIRS/Vis and HSB high-rate quantities) |
| Channel | 2378 | Dimension of channel array (Channels are generally in order of increasing wavenumber, but because frequencies can vary and because all detectors from a physical array of detector elements (a "module") are always grouped together there are sometimes small reversals in frequency order where modules overlap.) |

Geolocation Fields

These fields appear for every footprint (GeoTrack * GeoXTrack times) and correspond to footprint center coordinates and "shutter" time.

| Name | Explanation |
|-----------|--|
| Latitude | Footprint boresight geodetic Latitude in degrees North (-90.0 ... 90.0) |
| Longitude | Footprint boresight geodetic Longitude in degrees East (-180.0 ... 180.0) |
| Time | Footprint "shutter" TAI Time: floating-point elapsed seconds since Jan 1, 1993 |

Size: 291600 bytes (0.3 MB) per 45-scanset granule

Attributes

These fields appear only once per granule

| Name | Type | Extra Dimensions | Explanation |
|------------------|----------------------------|------------------|---|
| processing_level | string of 8-bit characters | None | Zero-terminated character string denoting processing level ("level1A") |
| instrument | string of 8-bit characters | None | Zero-terminated character string denoting instrument ("AIRS") |
| DayNightFlag | string of 8-bit characters | None | Zero-terminated character string denoting granule as day and/or night: (Always "Day", "Night", or "Both") |
| AutomaticQAFlag | string of 8-bit characters | None | Zero-terminated character string denoting granule data quality: (Always "Passed", "Failed", or "Suspect") |
| NumTotalData | 32-bit integer | None | Total number of expected AIRS packets |
| NumProcessData | 32-bit integer | None | Number of AIRS packets which are present and can be processed routinely (state = 0) |
| NumSpecialData | 32-bit integer | None | Number of AIRS packets which are present and can be processed only as a special test (state = 1) |
| NumBadData | 32-bit integer | None | Number of AIRS packets which are present but cannot be processed (state = 2) |
| NumMissingData | 32-bit integer | None | Number of expected AIRS packets which are not present (state = 3) |
| NumLandSurface | 32-bit integer | None | Number of scene footprints for which the surface is more than 90% land |
| NumOceanSurface | 32-bit integer | None | Number of scene footprints for which the surface is less than 10% land |

| | | | |
|-------------------|----------------------------|------|---|
| node_type | string of 8-bit characters | None | Zero-terminated character string denoting whether granule is ascending, descending, or pole-crossing: ("Ascending" and "Descending" for entirely ascending or entirely descending granules, or "NorthPole" or "SouthPole" for pole-crossing granules) |
| start_year | 32-bit integer | None | Year in which granule started, UTC (e.g. 1999) |
| start_month | 32-bit integer | None | Month in which granule started, UTC (1 ... 12) |
| start_day | 32-bit integer | None | Day of month in which granule started, UTC (1 ... 31) |
| start_hour | 32-bit integer | None | Hour of day in which granule started, UTC (0 ... 23) |
| start_minute | 32-bit integer | None | Minute of hour in which granule started, UTC (0 ... 59) |
| start_sec | 32-bit floating-point | None | Second of minute in which granule started, UTC (0.0 ... 59.0) |
| start_orbit | 32-bit integer | None | Orbit number of mission in which granule started |
| end_orbit | 32-bit integer | None | Orbit number of mission in which granule ended |
| orbit_path | 32-bit integer | None | Orbit path of start orbit (1 ... 233 as defined by EOS project) |
| start_orbit_row | 32-bit integer | None | Orbit row at start of granule (1 ... 248 as defined by EOS project) |
| end_orbit_row | 32-bit integer | None | Orbit row at end of granule (1 ... 248 as defined by EOS project) |
| granule_number | 32-bit integer | None | Number of granule within day (1 ... 240) |
| num_scansets | 32-bit integer | None | Number of scansets in granule (1 ... 45) |
| num_scanlines | 32-bit integer | None | Number of scanlines in granule (3 * num_scansets) |
| start_Latitude | 64-bit floating-point | None | Geodetic Latitude of spacecraft at start of granule in degrees North (-90.0 ... 90.0) |
| start_Longitude | 64-bit floating-point | None | Geodetic Longitude of spacecraft at start of granule in degrees East (-180.0 ... 180.0) |
| start_Time | 64-bit floating-point | None | TAI Time at start of granule (floating-point elapsed seconds since start of 1993) |
| end_Latitude | 64-bit floating-point | None | Geodetic Latitude of spacecraft at end of granule in degrees North (-90.0 ... 90.0) |
| end_Longitude | 64-bit floating-point | None | Geodetic Longitude of spacecraft at end of granule in degrees East (-180.0 ... 180.0) |
| end_Time | 64-bit floating-point | None | TAI Time at end of granule (floating-point elapsed seconds since start of 1993) |
| eq_x_longitude | 32-bit floating-point | None | Longitude of spacecraft at southward equator crossing nearest granule start in degrees East (-180.0 ... 180.0) |
| eq_x_tai | 64-bit floating-point | None | Time of eq_x_longitude in TAI units (floating-point elapsed seconds since start of 1993) |
| orbitgeoqa | 32-bit unsigned integer | None | Orbit Geolocation QA: bit 0 (LSB): bad input value (last scanline); bit 1: bad input value (first scanline); bit 2: PGS_EPH_GetEphMet() returned PGSEPH_E_NO_SC_EPHEM_FILE; bit 3: PGS_EPH_GetEphMet() returned PGSEPH_E_BAD_ARRAY_SIZE; bit 4: PGS_EPH_GetEphMet() returned PGSTD_E_TIME_FMT_ERROR; bit 5: PGS_EPH_GetEphMet() returned PGSTD_E_TIME_VALUE_ERROR; bit 6: PGS_EPH_GetEphMet() returned PGSTD_E_SC_TAG_UNKNOWN; bit 7: PGS_EPH_GetEphMet() returned PGS_E_TOOLKIT; bit 8: PGS_TD_UTCToTAI() returned PGSTD_E_NO_LEAP_SECS; bit 9: PGS_TD_UTCToTAI() returned PGSTD_E_TIME_FMT_ERROR; bit 10: PGS_TD_UTCToTAI() returned PGSTD_E_TIME_VALUE_ERROR; bit 11: PGS_TD_UTCToTAI() returned PGS_E_TOOLKIT; bit 12: PGS_CSC_DayNight() returned PGSTD_E_NO_LEAP_SECS; bit 13: PGS_CSC_DayNight() returned PGSCSC_E_INVALID_LIMITTAG; bit 14: PGS_CSC_DayNight() returned PGSCSC_E_BAD_ARRAY_SIZE; bit 15: PGS_CSC_DayNight() returned PGSCSC_W_ERROR_IN_DAYNIGHT; bit 16: PGS_CSC_DayNight() returned PGSCSC_W_BAD_TRANSFORM_VALUE; bit 17: PGS_CSC_DayNight() returned PGSCSC_W_BELOW_HORIZON; bit 18: PGS_CSC_DayNight() returned PGSCSC_W_PREDICTED_UT1; bit 19: PGS_CSC_DayNight() returned PGSTD_E_NO_UT1_VALUE; bit 20: PGS_CSC_DayNight() returned PGSTD_E_BAD_INITIAL_TIME; bit 21: PGS_CSC_DayNight() returned PGSCBP_E_TIME_OUT_OF_RANGE; bit 22: PGS_CSC_DayNight() returned PGSCBP_E_UNABLE_TO_OPEN_FILE; bit 23: PGS_CSC_DayNight() returned PGSMEM_E_NO_MEMORY; bit 24: PGS_CSC_DayNight() returned PGS_E_TOOLKIT; bit 25-31: not used |
| num_satgeoqa | 16-bit integer | None | Number of scans with problems in satgeoqa |
| num_glintgeoqa | 16-bit integer | None | Number of scans with problems in glintgeoqa |
| num_moongeoqa | 16-bit integer | None | Number of scans with problems in moongeoqa |
| num_ftptgeoqa | 16-bit integer | None | Number of footprints with problems in ftptgeoqa |
| num_zengeoqa | 16-bit integer | None | Number of footprints with problems in zengeoqa |
| num_demgeoqa | 16-bit integer | None | Number of footprints with problems in demgeoqa |
| num_fpe | 16-bit integer | None | Number of floating point errors |
| LonGranuleCen | 16-bit integer | None | Geodetic Longitude of the center of the granule in degrees East (-180 ... 180) |
| LatGranuleCen | 16-bit integer | None | Geodetic Latitude of the center of the granule in degrees North (-90 ... 90) |
| LocTimeGranuleCen | 16-bit integer | None | Local solar time at the center of the granule in minutes past midnight (0 ... 1439) |

| | | | |
|---------------|--|------------------|--|
| apid_414_cnt | AIRS Engineering Packet Counts (see below) | None | Counts of packets of APID 414 (AIRS fixed high-rate engineering 1) by condition |
| apid_415_cnt | AIRS Engineering Packet Counts (see below) | None | Counts of packets of APID 415 (AIRS fixed high-rate engineering 2) by condition |
| apid_416_cnt | AIRS Engineering Packet Counts (see below) | None | Counts of packets of APID 416 (AIRS flexible high-rate engineering 1) by condition |
| apid_417_cnt | AIRS Engineering Packet Counts (see below) | None | Counts of packets of APID 417 (AIRS flexible high-rate engineering 2) by condition |
| reflector_dev | Unlimited Engineering Struct (see below) | GeoXTrack (= 90) | Statistics describing deviations of the viewing angle "scanang" from expected scan position for each footprint position averaged over the scanlines in the granule (degrees) |
| apid_404_cnt | AIRS Science/Calibration Packet Counts (see below) | None | Counts of packets of APID 404 (AIRS Science) by condition |
| DCRCcount | 32-bit integer | None | Number of times a Direct Current Restore was executed for any module |

Size: 5265 bytes (0.0 MB) per granule

Along-Track Data Fields

These fields appear once per scanline (GeoTrack times)

| Name | Type | Extra Dimensions | Explanation |
|------------|-------------------------|------------------|--|
| satheight | 32-bit floating-point | None | Satellite altitude at nadirTAI in km above reference ellipsoid (e.g. 725.2) |
| satroll | 32-bit floating-point | None | Satellite attitude roll angle at nadirTAI (-180.0 ... 180.0 angle about the +x (roll) ORB axis, +x axis is positively oriented in the direction of orbital flight completing an orthogonal triad with y and z.) |
| satpitch | 32-bit floating-point | None | Satellite attitude pitch angle at nadirTAI (-180.0 ... 180.0 angle about +y (pitch) ORB axis. +y axis is oriented normal to the orbit plane with the positive sense opposite to that of the orbit's angular momentum vector H.) |
| satyaw | 32-bit floating-point | None | Satellite attitude yaw angle at nadirTAI (-180.0 ... 180.0 angle about +z (yaw) axis. +z axis is positively oriented earthward parallel to the satellite radius vector R from the spacecraft center of mass to the center of the Earth.) |
| satgeoqa | 32-bit unsigned integer | None | Satellite Geolocation QA flags: bit 0 (LSB): bad input value; bit 1: PGS_TD_TAItoUTC() returned PGSTD_E_NO_LEAP_SECS; bit 2: PGS_TD_TAItoUTC() returned PGS_E_TOOLKIT; bit 3: PGS_EPH_EphemAttit() returned PGSEPH_W_BAD_EPHEM_VALUE; bit 4: PGS_EPH_EphemAttit() returned PGSEPH_E_BAD_EPHEM_FILE_HDR; bit 5: PGS_EPH_EphemAttit() returned PGSEPH_E_NO_SC_EPHEM_FILE; bit 6: PGS_EPH_EphemAttit() returned PGSEPH_E_NO_DATA_REQUESTED; bit 7: PGS_EPH_EphemAttit() returned PGSTD_E_SC_TAG_UNKNOWN; bit 8: PGS_EPH_EphemAttit() returned PGSEPH_E_BAD_ARRAY_SIZE; bit 9: PGS_EPH_EphemAttit() returned PGSTD_E_TIME_FMT_ERROR; bit 10: PGS_EPH_EphemAttit() returned PGSTD_E_TIME_VALUE_ERROR; bit 11: PGS_EPH_EphemAttit() returned PGSTD_E_NO_LEAP_SECS; bit 12: PGS_EPH_EphemAttit() returned PGS_E_TOOLKIT; bit 13: PGS_CSC_ECtoECR() returned PGSCSC_W_BAD_TRANSFORM_VALUE; bit 14: PGS_CSC_ECtoECR() returned PGSCSC_E_BAD_ARRAY_SIZE; bit 15: PGS_CSC_ECtoECR() returned PGSTD_E_NO_LEAP_SECS; bit 16: PGS_CSC_ECtoECR() returned PGSTD_E_TIME_FMT_ERROR; bit 17: PGS_CSC_ECtoECR() returned PGSTD_E_TIME_VALUE_ERROR; bit 18: unused (set to zero); bit 19: PGS_CSC_ECtoECR() returned PGSTD_E_NO_UT1_VALUE; bit 20: PGS_CSC_ECtoECR() returned PGS_E_TOOLKIT; bit 21: PGS_CSC_ECRtoGEO() returned PGSCSC_W_TOO_MANY_ITERS; bit 22: PGS_CSC_ECRtoGEO() returned PGSCSC_W_INVALID_ALTITUDE; bit 23: PGS_CSC_ECRtoGEO() returned PGSCSC_W_SPHERE_BODY; bit 24: PGS_CSC_ECRtoGEO() returned PGSCSC_W_LARGE_FLATTENING; bit 25: PGS_CSC_ECRtoGEO() returned PGSCSC_W_DEFAULT_EARTH_MODEL; bit 26: PGS_CSC_ECRtoGEO() returned PGSCSC_E_BAD_EARTH_MODEL; bit 27: PGS_CSC_ECRtoGEO() returned PGS_E_TOOLKIT; bit 28-31: not used |
| glintgeoqa | 16-bit unsigned integer | None | Glint Geolocation QA flags: bit 0 (LSB): bad input value; bit 1: glint location in Earth's shadow; bit 2: glint calculation not converging; bit 3: glint location sun vs. satellite zenith mismatch; bit 4: glint location sun vs. satellite azimuth mismatch; bit 5: bad glint location; bit 6: PGS_CSC_ZenithAzimuth() returned any 'W' class return code; bit 7: PGS_CSC_ZenithAzimuth() returned any 'E' class return code; bit 8: PGS_CBP_Earth_CB_Vector() returned any 'W' class return code; bit 9: PGS_CBP_Earth_CB_Vector() returned any 'E' class return code; bit 10: PGS_CSC_ECtoECR() returned any 'W' class return code except PGSCSC_W_PREDICTED_UT1 (for Glint); bit 11: PGS_CSC_ECtoECR() returned any 'E' class return code (for Glint); bit 12: PGS_CSC_ECRtoGEO() returned any 'W' class return code (for Glint); bit 13: PGS_CSC_ECRtoGEO() returned any 'E' class return code (for Glint); bit 14: PGS_CSC_ECtoECR() returned any 'W' class return code except PGSCSC_W_PREDICTED_UT1; bit 15: PGS_CSC_ECtoECR() returned any 'E' class return code |
| moongeoqa | 16-bit | None | Moon Geolocation QA flags: bit 0 (LSB): bad input value; bit 1: PGS_TD_TAItoUTC() returned |

| | | | |
|------------------|-------------------------|------|---|
| | unsigned integer | | PGSTD_E_NO_LEAP_SECS; bit 2: PGS_TD_TAtoUTC() returned PGS_E_TOOLKIT; bit 3: PGS_CBP_Sat_CB_Vector() returned PGSCSC_W_BELOW_SURFACE; bit 4: PGS_CBP_Sat_CB_Vector() returned PGSCBP_W_BAD_CB_VECTOR; bit 5: PGS_CBP_Sat_CB_Vector() returned PGSCBP_E_BAD_ARRAY_SIZE; bit 6: PGS_CBP_Sat_CB_Vector() returned PGSCBP_E_INVALID_CB_ID; bit 7: PGS_CBP_Sat_CB_Vector() returned PGSMEM_E_NO_MEMORY; bit 8: PGS_CBP_Sat_CB_Vector() returned PGSCBP_E_UNABLE_TO_OPEN_FILE; bit 9: PGS_CBP_Sat_CB_Vector() returned PGSTD_E_BAD_INITIAL_TIME; bit 10: PGS_CBP_Sat_CB_Vector() returned PGSCBP_E_TIME_OUT_OF_RANGE; bit 11: PGS_CBP_Sat_CB_Vector() returned PGSTD_E_SC_TAG_UNKNOWN; bit 12: PGS_CBP_Sat_CB_Vector() returned PGSEPH_E_BAD_EPHEM_FILE_HDR; bit 13: PGS_CBP_Sat_CB_Vector() returned PGSEPH_E_NO_SC_EPHEM_FILE; bit 14: PGS_CBP_Sat_CB_Vector() returned PGS_E_TOOLKIT; bit 15: not used |
| nadirTAI | 64-bit floating-point | None | TAI time at which instrument is nominally looking directly down. (between footprints 15 & 16 for AMSU or between footprints 45 & 46 for AIRS/Vis & HSB) (floating-point elapsed seconds since start of 1993) |
| sat_lat | 64-bit floating-point | None | Satellite geodetic latitude in degrees North (-90.0 ... 90.0) |
| sat_lon | 64-bit floating-point | None | Satellite geodetic longitude in degrees East (-180.0 ... 180.0) |
| scan_node_type | 8-bit integer | None | 'A' for ascending, 'D' for descending, 'N' for North-Polar, 'S' for South-Polar |
| glintlat | 32-bit floating-point | None | Solar glint geodetic latitude in degrees North at nadirTAI (-90.0 ... 90.0) |
| glintlon | 32-bit floating-point | None | Solar glint geodetic longitude in degrees East at nadirTAI (-180.0 ... 180.0) |
| EngDataFmtm1 | 16-bit unsigned integer | None | Data field format used for multiple alternate lists from HR Eng packet 1 (=13 for default (fixed format); see AIRS THB Table 4-2) |
| EngDataFmtm2 | 16-bit unsigned integer | None | Data field format used for multiple alternate lists from HR Eng packet 2 (=13 for default (fixed format); see AIRS THB Table 4-2) |
| EdABIndic1 | 32-bit floating-point | None | EDC A/B Powered on Indicator (A=2.5 B=0) (Volts) |
| EdABIndic2 | 32-bit floating-point | None | EDC A/B Powered on Indicator (A=2.5 B=0) (Volts) |
| OpMode | 16-bit unsigned integer | None | Instrument Operations Mode. See AIRS Command Handbook, section 6.4 for a definition of each bit. bits 0 (LSB)-2 cal phase; bits 3-6 Cal Func; bit 7 quicklook (expedited) flag; bits 8-11 submode bits 12-14 Mode (0=standby, 1=ready, 2=operate, 3=checkout, 4=decontaminate, 5=off, 6=survival); bit 16 transition flag |
| ScOpModeCurr | 8-bit unsigned integer | None | Scanner Operating Mode - current mode. 0=Power Down; 1=Idle; 2=Find Index; 3=Scan; 4=Point; 5=Shut Down; 6=Idle/Index Found |
| ScOpModeCmded | 8-bit unsigned integer | None | Scanner Operating Mode - commanded mode. 0=Power Down; 1=Idle; 2=Find Index; 3=Scan; 4=Point; 5=Shut Down; 6=Idle/Index Found |
| RTShrdMemFail | 8-bit unsigned integer | None | Flag indicating test of remote term mem failed - bit 15 (msb) of sw status wd 1 |
| MemoryFail | 8-bit unsigned integer | None | RAM failure detected by Perform Memory Test - bit 12 of software status word 1 |
| ROMChecksumError | 8-bit unsigned integer | None | ROM checksum error detected by Perform Memory Test - bit 11 of sw status word 1 |
| RTMessgeError | 8-bit unsigned integer | None | Summit chip reported remote terminal message error - bit 9 of sw status word 1 |
| MissingEDTC | 8-bit unsigned integer | None | End of Data Transfer Cycle msg not recvd in time - bit 8 of sw status word 1 |
| MissngTimSync | 8-bit unsigned integer | None | S/C time code or sync signals missing several times - bit 7 of sw status word 1 |
| VCXOConstrErr | 8-bit unsigned integer | None | VCXO Constr Error - bit 6 of software status word 1 |
| InsClkHldgOvw | 8-bit unsigned integer | None | Flag indicating inst clock holding reg overwritten - bit 5 of sw status word 1 |
| InstClkAdjust | 8-bit unsigned integer | None | Flag indicating inst clock adjusted to s/c time signal - bit 3 of sw status wd 1 |
| ResetCause | 8-bit unsigned integer | None | Cause of the latest software reset - bits 2 - 0 (LSBs) of software status word 1 |
| ICIProtFault | 8-bit unsigned integer | None | ICI Protection Fault - bit 14 of software status word 2 |
| ICInvalRange | 8-bit unsigned integer | None | ICI Invalid Range - bit 13 of software status word 2 |
| ICInvChannel | 8-bit unsigned integer | None | Flag indicating invalid port number in a serial cmd - bit 11 of sw status word 2 |

| | | | |
|------------------|-------------------------|------|---|
| RTBITFail | 8-bit unsigned integer | None | Flag indicating remote terminal BIT test failed - bit 10 of sw status word 2 |
| AmaRelayFaild | 8-bit unsigned integer | None | Flag indicating AMA actuator selection failed - bit 14 of software status word 3 |
| AmaStepFailed | 8-bit unsigned integer | None | Actuator failed to move requested number of steps - bit 13 of sw status word 3 |
| Ama3EndState | 8-bit unsigned integer | None | AMA end state for actuator #3 - bits 12 - 10 of software status word 3 |
| Ama2EndState | 8-bit unsigned integer | None | AMA end state for actuator #2 - bits 9 - 7 of software status word 3 |
| ScnrOpnFail | 8-bit unsigned integer | None | Flag indicating scanner failed to perform as expected - bit 5 of sw status wd 2 |
| Ama1EndState | 8-bit unsigned integer | None | AMA end state for actuator #1 - bits 6 - 4 of software status word 3 |
| AmaSwStatus | 8-bit unsigned integer | None | AMA software processing state - bits 3 - 1 of software status word 3 |
| ScannrAtPoint | 8-bit unsigned integer | None | Flag indicating scanner is pointing in cmded direction - bit 0 of sw status wd 3 |
| AmalnvwSwState | 8-bit unsigned integer | None | Flag indicating AMA reached an illegal state - bit 15 (msb) of sw status word 3 |
| ChPhaseErr | 32-bit floating-point | None | Chopper Phase Error (deg) |
| spacecraft_state | 8-bit integer | None | Spacecraft state (0=LNCH; 1=STBY; 2=SCI; 3=SAFE; 4=SRVL; 5-7=UNDF) (set to -1 when not known) |
| DpCircCount | 16-bit unsigned integer | None | Data Processing circumvention counts (active A or B) (counts) |
| DpCircBasThr | 16-bit unsigned integer | None | Data Processing circumvention base threshold (active A or B) |

Size: 14175 bytes (0.0 MB) per 45-scanset granule

Full Swath Data Fields

These fields appear for every footprint of every scanline in the granule (GeoTrack * GeoXTrack times)

| Name | Type | Extra Dimensions | Explanation |
|-----------|-------------------------|------------------|---|
| scanang | 32-bit floating-point | None | Scanning angle of AIRS instrument with respect to the AIRS instrument for this footprint (-180.0 ... 180.0, negative at start of scan, 0 at nadir) |
| ftptgeoqa | 32-bit unsigned integer | None | Footprint Geolocation QA flags: bit 0 (LSB): bad input value; bit 1: PGS_TD_TAItoUTC() returned PGSTD_E_NO_LEAP_SECS; bit 2: PGS_TD_TAItoUTC() returned PGS_E_TOOLKIT; bit 3: PGS_CSC_GetFOV_Pixel() returned PGSCSC_W_MISS_EARTH; bit 4: PGS_CSC_GetFOV_Pixel() returned PGSTD_E_SC_TAG_UNKNOWN; bit 5: PGS_CSC_GetFOV_Pixel() returned PGSCSC_W_ZERO_PIXEL_VECTOR; bit 6: PGS_CSC_GetFOV_Pixel() returned PGSCSC_W_BAD_EPH_FOR_PIXEL; bit 7: PGS_CSC_GetFOV_Pixel() returned PGSCSC_W_INSTRUMENT_OFF_BOARD; bit 8: PGS_CSC_GetFOV_Pixel() returned PGSCSC_W_BAD_ACCURACY_FLAG; bit 9: PGS_CSC_GetFOV_Pixel() returned PGSCSC_E_BAD_ARRAY_SIZE; bit 10: PGS_CSC_GetFOV_Pixel() returned PGSCSC_W_DEFAULT_EARTH_MODEL; bit 11: PGS_CSC_GetFOV_Pixel() returned PGSCSC_W_DATA_FILE_MISSING; bit 12: PGS_CSC_GetFOV_Pixel() returned PGSCSC_E_NEG_OR_ZERO_RAD; bit 13: PGS_CSC_GetFOV_Pixel() returned PGSMEM_E_NO_MEMORY; bit 14: PGS_CSC_GetFOV_Pixel() returned PGSTD_E_NO_LEAP_SECS; bit 15: PGS_CSC_GetFOV_Pixel() returned PGSTD_E_TIME_FMT_ERROR; bit 16: PGS_CSC_GetFOV_Pixel() returned PGSTD_E_TIME_VALUE_ERROR; bit 17: PGS_CSC_GetFOV_Pixel() returned PGSCSC_W_PREDICTED_UT1; bit 18: PGS_CSC_GetFOV_Pixel() returned PGSTD_E_NO_UT1_VALUE; bit 19: PGS_CSC_GetFOV_Pixel() returned PGS_E_TOOLKIT; bit 20: PGS_CSC_GetFOV_Pixel() returned PGSEPH_E_BAD_EPHEM_FILE_HDR; bit 21: PGS_CSC_GetFOV_Pixel() returned PGSEPH_E_NO_SC_EPHEM_FILE; bit 22-31: not used |
| zengeoqa | 16-bit unsigned integer | None | Satellite zenith Geolocation QA flags: bit 0 (LSB): (Spacecraft) bad input value; bit 1: PGS_CSC_ZenithAzimuth(S/C) returned PGSCSC_W_BELOW_HORIZON; bit 2: PGS_CSC_ZenithAzimuth(S/C) returned PGSCSC_W_UNDEFINED_AZIMUTH; bit 3: PGS_CSC_ZenithAzimuth(S/C) returned PGSCSC_W_NO_REFRACTION; bit 4: PGS_CSC_ZenithAzimuth(S/C) returned PGSCSC_E_INVALID_VECTAG; bit 5: PGS_CSC_ZenithAzimuth(S/C) returned PGSCSC_E_LOOK_PT_ALTIT_RANGE; bit 6: PGS_CSC_ZenithAzimuth(S/C) returned PGSCSC_E_ZERO_INPUT_VECTOR; bit 7: PGS_CSC_ZenithAzimuth(S/C) returned PGS_E_TOOLKIT; bit 8: (Sun) bad input value; bit 9: (suppressed) PGS_CSC_ZenithAzimuth(Sun) returned PGSCSC_W_BELOW_HORIZON (This is not an error condition - the sun is below the horizon at night); bit 10: PGS_CSC_ZenithAzimuth(Sun) returned PGSCSC_W_UNDEFINED_AZIMUTH; bit 11: PGS_CSC_ZenithAzimuth(Sun) returned PGSCSC_W_NO_REFRACTION; bit 12: PGS_CSC_ZenithAzimuth(Sun) returned PGSCSC_E_INVALID_VECTAG; bit 13: PGS_CSC_ZenithAzimuth(Sun) returned PGSCSC_E_LOOK_PT_ALTIT_RANGE; bit 14: PGS_CSC_ZenithAzimuth(Sun) returned PGSCSC_E_ZERO_INPUT_VECTOR; bit 15: |

| | | | |
|--------------------|-------------------------|------------------|---|
| | | | PGS_CSC_ZenithAzimuth(Sun) returned PGS_E_TOOLKIT |
| demgeoqa | 16-bit unsigned integer | None | Digital Elevation Model (DEM) Geolocation QA flags: bit 0 (LSB): bad input value; bit 1: Could not allocate memory; bit 2: Too close to North or South pole. Excluded; bit 3: Layer resolution incompatibility. Excluded; bit 4: Any DEM Routine (elev) returned PGSDEM_E_IMPROPER_TAG; bit 5: Any DEM Routine (elev) returned PGSDEM_E_CANNOT_ACCESS_DATA; bit 6: Any DEM Routine (land/water) returned PGSDEM_E_IMPROPER_TAG; bit 7: Any DEM Routine (land/water) returned PGSDEM_E_CANNOT_ACCESS_DATA; bit 8: Reserved for future layers; bit 9: Reserved for future layers; bit 10: PGS_DEM_GetRegion(elev) returned PGSDEM_M_FILLVALUE_INCLUDED; bit 11: PGS_DEM_GetRegion(land/water) returned PGSDEM_M_FILLVALUE_INCLUDED; bit 12: Reserved for future layers; bit 13: PGS_DEM_GetRegion(all) returned PGSDEM_M_MULTIPLE_RESOLUTIONS; bit 14: PGS_CSC_GetFOV_Pixel() returned any 'W' class return code except PGSCSC_W_PREDICTED_UT1; bit 15: PGS_CSC_GetFOV_Pixel() returned any 'E' class return code |
| satzen | 32-bit floating-point | None | Spacecraft zenith angle (0.0 ... 180.0) degrees from zenith (measured relative to the geodetic vertical on the reference (WGS84) spheroid and including corrections outlined in EOS SDP toolkit for normal accuracy.) |
| satazi | 32-bit floating-point | None | Spacecraft azimuth angle (-180.0 ... 180.0) degrees E of N GEO |
| solzen | 32-bit floating-point | None | Solar zenith angle (0.0 ... 180.0) degrees from zenith (measured relative to the geodetic vertical on the reference (WGS84) spheroid and including corrections outlined in EOS SDP toolkit for normal accuracy.) |
| solazi | 32-bit floating-point | None | Solar azimuth angle (-180.0 ... 180.0) degrees E of N GEO |
| sun_glint_distance | 16-bit integer | None | Distance (km) from footprint center to location of the sun glint (-9999 for unknown, 30000 for no glint visible because spacecraft is in Earth's shadow) |
| topog | 32-bit floating-point | None | Mean topography in meters above reference ellipsoid |
| topog_err | 32-bit floating-point | None | Error estimate for topog |
| landFrac | 32-bit floating-point | None | Fraction of spot that is land (0.0 ... 1.0) |
| landFrac_err | 32-bit floating-point | None | Error estimate for landFrac |
| counts | 16-bit unsigned integer | Channel (= 2378) | raw counts (data numbers) for each channel (Note: any values received with all (12-14) bits high will be sign-extended to FF) |
| state | 32-bit integer | None | Data state: 0:Process, 1:Special, 2:Erroneous, 3:Missing |

Size: 58392900 bytes (58.4 MB) per 45-scanset granule

**Total File Size (plus storage for dimensions and other HDF-EOS overhead):
58703940 bytes (58.7 MB) per 45-scanset granule = 14088.9 MB per day**

Special AIRS Types

Unlimited Engineering Struct: This type is used for engineering data fields for which there are NOT known "yellow" limits

| Field Name | Type | Explanation |
|------------|-----------------------|---|
| min | 32-bit floating-point | Minimum value field takes on in granule (not valid when num = 0) |
| max | 32-bit floating-point | Maximum value field takes on in granule (not valid when num = 0) |
| mean | 32-bit floating-point | Mean of values field takes on in granule (not valid when num = 0) |
| dev | 32-bit floating-point | Standard Deviation of values field takes on in granule (not valid when num = 0) |
| num | 32-bit integer | Count of occurrences of field in granule (not including those counted in num_bad) |
| num_bad | 32-bit integer | Count of occasions on which field takes on invalid flag value (-9999) in granule |
| max_track | 32-bit integer | GeoTrack index (counting from 1) where max was found |
| max_xtrack | 32-bit integer | GeoXTrack index (counting from 1) where max was found |
| min_track | 32-bit integer | GeoTrack index (counting from 1) where min was found |
| min_xtrack | 32-bit integer | GeoXTrack index (counting from 1) where min was found |

AIRS Engineering Packet Counts: This type tracks counts of packets received during an interval by conditions under which they were received

| Field Name | Type | Explanation |
|------------|------|-------------|
|------------|------|-------------|

| | | |
|--------------|----------------|---|
| missing_in | 16-bit integer | Count of packets missing between packets that are present |
| missing_ends | 16-bit integer | Count of packets missing at beginning or end of granule timespan: missing packets for which there are either no existing packets before them or no existing packets after them. (When all data is missing all packets will be counted here) |
| checksum_err | 16-bit integer | Count of packets with an error detected in the checksum |
| good | 16-bit integer | Count of packets not counted in any other category |

AIRS Science/Calibration Packet Counts: This type tracks counts of packets received during an interval by conditions under which they were received

| Field Name | Type | Explanation |
|--------------|----------------|---|
| missing_in | 16-bit integer | Count of packets missing between packets of any AIRS APID that are present |
| missing_ends | 16-bit integer | Count of packets missing at beginning or end of granule timespan: missing packets for which there are either no existing packets before them or no existing packets after them. (When all data is missing all packets will be counted here) |
| at_noop | 16-bit integer | Count of packets for which the spacecraft mode is not operational for some or all of the packet interval |
| illegal_mode | 16-bit integer | Count of packets for which there was an illegal instrument mode |
| special_cal | 16-bit integer | Count of packets for which the instrument was in a special calibration mode |
| invalid_data | 16-bit integer | Count of invalid packets (includes missing engineering) |
| checksum_err | 16-bit integer | Count of packets with an error detected in the checksum |
| good | 16-bit integer | Count of packets not counted in any other category |

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A1-2. L1A AIRS Calibration Interface Specification

Interface Specification Version 3.0.4.0
2003-05-19

ESDT ShortName = "AIRIACAL"

Swath Name = "L1A_AIRS_Calibration"

Level = "level1A"

Footprints = 6

scanlines per scanset = 3

Dimensions

These fields define all dimensions that can be used for HDF-EOS swath fields.

The names "GeoTrack" and "GeoXTrack" have a special meaning for this document: "Cross-Track" data fields have a hidden dimension of "GeoXTrack"; "Along-Track" data fields have a hidden dimension of "GeoTrack"; "Full Swath Data Fields have hidden dimensions of both "GeoTrack" and "GeoXTrack".

| Name | Value | Explanation |
|-------------|--------------------------|---|
| GeoXTrack | 6 | Dimension "across" track for calibration footprint positions. Same as number of calibration footprints per scanline. (NUM_FOOTPRINTS_AIRS_CALIB) (Footprints are ordered: 1-4: spaceviews (ports 3, 4, 1, 2); 5: blackbody radiometric calibration source; 6: spectral/photometric calibration sources) |
| SpaceXTrack | 4 | Dimension "across" track for spaceview calibration footprint positions in order of observation time. (NUM_FOOTPRINTS_AIRS_SPACE) |
| BBXTrack | 1 | Dimension "across" track for blackbody calibration footprint positions in order of observation time. (NUM_FOOTPRINTS_AIRS_BB) |
| GeoTrack | # of scan lines in swath | Dimension along track for footprint positions. Same as number of scanlines in granule. Parallel to the satellite's path, increasing with time. (Nominally 45 for Level-2, AMSU-A, and AIRS/Vis low-rate engineering; 135 for AIRS/Vis and HSB high-rate quantities) |
| Channel | 2378 | Dimension of channel array (Channels are generally in order of increasing wavenumber, but because frequencies can vary and because all detectors from a physical array of detector elements (a "module") are always grouped together there are sometimes small reversals in frequency order where modules overlap.) |

Geolocation Fields

These fields appear once per scanline and correspond to satellite coordinates at time of nadir view

| Name | Explanation |
|-----------|---|
| Latitude | Spacecraft geodetic Latitude at nadirTAI in degrees North (-90.0 ... 90.0) |
| Longitude | Spacecraft geodetic Longitude at nadirTAI in degrees East (-180.0 ... 180.0) |
| Time | nadirTAI: time of nadir view (half-way between footprints 45 & 46) floating-point elapsed seconds since Jan 1, 1993 |

Size: 3240 bytes (0.0 MB) per 45-scanset granule

Attributes

These fields appear only once per granule

| Name | Type | Extra Dimensions | Explanation |
|------------------|----------------------------|------------------|---|
| processing_level | string of 8-bit characters | None | Zero-terminated character string denoting processing level ("level1A") |
| instrument | string of 8-bit characters | None | Zero-terminated character string denoting instrument ("AIRS") |
| DayNightFlag | string of 8-bit characters | None | Zero-terminated character string denoting granule as day and/or night: (Always "Day", "Night", or "Both") |
| AutomaticQAFlag | string of 8-bit characters | None | Zero-terminated character string denoting granule data quality: (Always "Passed", "Failed", or "Suspect") |
| NumTotalData | 32-bit integer | None | Total number of expected AIRS packets |
| NumProcessData | 32-bit integer | None | Number of AIRS packets which are present and can be processed routinely (state = 0) |
| NumSpecialData | 32-bit integer | None | Number of AIRS packets which are present and can be processed only as a special test (state = 1) |
| NumBadData | 32-bit integer | None | Number of AIRS packets which are present but cannot be processed (state = 2) |

| | | | |
|-----------------|----------------------------|------|---|
| NumMissingData | 32-bit integer | None | Number of expected AIRS packets which are not present (state = 3) |
| NumLandSurface | 32-bit integer | None | Number of scene footprints for which the surface is more than 90% land |
| NumOceanSurface | 32-bit integer | None | Number of scene footprints for which the surface is less than 10% land |
| node_type | string of 8-bit characters | None | Zero-terminated character string denoting whether granule is ascending, descending, or pole-crossing: ("Ascending" and "Descending" for entirely ascending or entirely descending granules, or "NorthPole" or "SouthPole" for pole-crossing granules) |
| start_year | 32-bit integer | None | Year in which granule started, UTC (e.g. 1999) |
| start_month | 32-bit integer | None | Month in which granule started, UTC (1 ... 12) |
| start_day | 32-bit integer | None | Day of month in which granule started, UTC (1 ... 31) |
| start_hour | 32-bit integer | None | Hour of day in which granule started, UTC (0 ... 23) |
| start_minute | 32-bit integer | None | Minute of hour in which granule started, UTC (0 ... 59) |
| start_sec | 32-bit floating-point | None | Second of minute in which granule started, UTC (0.0 ... 59.0) |
| start_orbit | 32-bit integer | None | Orbit number of mission in which granule started |
| end_orbit | 32-bit integer | None | Orbit number of mission in which granule ended |
| orbit_path | 32-bit integer | None | Orbit path of start orbit (1 ... 233 as defined by EOS project) |
| start_orbit_row | 32-bit integer | None | Orbit row at start of granule (1 ... 248 as defined by EOS project) |
| end_orbit_row | 32-bit integer | None | Orbit row at end of granule (1 ... 248 as defined by EOS project) |
| granule_number | 32-bit integer | None | Number of granule within day (1 ... 240) |
| num_scansets | 32-bit integer | None | Number of scansets in granule (1 ... 45) |
| num_scanlines | 32-bit integer | None | Number of scanlines in granule (3 * num_scansets) |
| start_Latitude | 64-bit floating-point | None | Geodetic Latitude of spacecraft at start of granule in degrees North (-90.0 ... 90.0) |
| start_Longitude | 64-bit floating-point | None | Geodetic Longitude of spacecraft at start of granule in degrees East (-180.0 ... 180.0) |
| start_Time | 64-bit floating-point | None | TAI Time at start of granule (floating-point elapsed seconds since start of 1993) |
| end_Latitude | 64-bit floating-point | None | Geodetic Latitude of spacecraft at end of granule in degrees North (-90.0 ... 90.0) |
| end_Longitude | 64-bit floating-point | None | Geodetic Longitude of spacecraft at end of granule in degrees East (-180.0 ... 180.0) |
| end_Time | 64-bit floating-point | None | TAI Time at end of granule (floating-point elapsed seconds since start of 1993) |
| eq_x_longitude | 32-bit floating-point | None | Longitude of spacecraft at southward equator crossing nearest granule start in degrees East (-180.0 ... 180.0) |
| eq_x_tai | 64-bit floating-point | None | Time of eq_x_longitude in TAI units (floating-point elapsed seconds since start of 1993) |
| orbitgeoqa | 32-bit unsigned integer | None | Orbit Geolocation QA: bit 0 (LSB): bad input value (last scanline); bit 1: bad input value (first scanline); bit 2: PGS_EPH_GetEphMet() returned PGSEPH_E_NO_SC_EPHEM_FILE; bit 3: PGS_EPH_GetEphMet() returned PGSEPH_E_BAD_ARRAY_SIZE; bit 4: PGS_EPH_GetEphMet() returned PGSTD_E_TIME_FMT_ERROR; bit 5: PGS_EPH_GetEphMet() returned PGSTD_E_TIME_VALUE_ERROR; bit 6: PGS_EPH_GetEphMet() returned PGSTD_E_SC_TAG_UNKNOWN; bit 7: PGS_EPH_GetEphMet() returned PGS_E_TOOLKIT; bit 8: PGS_TD_UTCToTAI() returned PGSTD_E_NO_LEAP_SECS; bit 9: PGS_TD_UTCToTAI() returned PGSTD_E_TIME_FMT_ERROR; bit 10: PGS_TD_UTCToTAI() returned PGSTD_E_TIME_VALUE_ERROR; bit 11: PGS_TD_UTCToTAI() returned PGS_E_TOOLKIT; bit 12: PGS_CSC_DayNight() returned PGSTD_E_NO_LEAP_SECS; bit 13: PGS_CSC_DayNight() returned PGSCSC_E_INVALID_LIMITTAG; bit 14: PGS_CSC_DayNight() returned PGSCSC_E_BAD_ARRAY_SIZE; bit 15: PGS_CSC_DayNight() returned PGSCSC_W_ERROR_IN_DAYNIGHT; bit 16: PGS_CSC_DayNight() returned PGSCSC_W_BAD_TRANSFORM_VALUE; bit 17: PGS_CSC_DayNight() returned PGSCSC_W_BELOW_HORIZON; bit 18: PGS_CSC_DayNight() returned PGSCSC_W_PREDICTED_UT1; bit 19: PGS_CSC_DayNight() returned PGSTD_E_NO_UT1_VALUE; bit 20: PGS_CSC_DayNight() returned PGSTD_E_BAD_INITIAL_TIME; bit 21: PGS_CSC_DayNight() returned PGSCBP_E_TIME_OUT_OF_RANGE; bit 22: PGS_CSC_DayNight() returned PGSCBP_E_UNABLE_TO_OPEN_FILE; bit 22: PGS_CSC_DayNight() returned PGSMEM_E_NO_MEMORY; bit 24: PGS_CSC_DayNight() returned PGS_E_TOOLKIT; bit 25-31: not used |
| num_satgeoqa | 16-bit integer | None | Number of scans with problems in satgeoqa |
| num_glintgeoqa | 16-bit integer | None | Number of scans with problems in glintgeoqa |
| num_moongeoqa | 16-bit integer | None | Number of scans with problems in moongeoqa |
| num_ftptgeoqa | 16-bit integer | None | Number of footprints with problems in ftptgeoqa |
| num_zengeoqa | 16-bit integer | None | Number of footprints with problems in zengeoqa |
| num_demgeoqa | 16-bit integer | None | Number of footprints with problems in demgeoqa |
| num_fpe | 16-bit integer | None | Number of floating point errors |

| | | | |
|-------------------|--|-----------------|--|
| LonGranuleCen | 16-bit integer | None | Geodetic Longitude of the center of the granule in degrees East (-180 ... 180) |
| LatGranuleCen | 16-bit integer | None | Geodetic Latitude of the center of the granule in degrees North (-90 ... 90) |
| LocTimeGranuleCen | 16-bit integer | None | Local solar time at the center of the granule in minutes past midnight (0 ... 1439) |
| apid_414_cnt | AIRS Engineering Packet Counts (see below) | None | Counts of packets of APID 414 (AIRS fixed high-rate engineering 1) by condition |
| apid_415_cnt | AIRS Engineering Packet Counts (see below) | None | Counts of packets of APID 415 (AIRS fixed high-rate engineering 2) by condition |
| apid_416_cnt | AIRS Engineering Packet Counts (see below) | None | Counts of packets of APID 416 (AIRS flexible high-rate engineering 1) by condition |
| apid_417_cnt | AIRS Engineering Packet Counts (see below) | None | Counts of packets of APID 417 (AIRS flexible high-rate engineering 2) by condition |
| apid_405_cnt | AIRS Science/Calibration Packet Counts (see below) | None | Counts of packets of APID 405 (AIRS Space) by condition |
| apid_406_cnt | AIRS Science/Calibration Packet Counts (see below) | None | Counts of packets of APID 406 (AIRS Blackbody) by condition |
| apid_407_cnt | AIRS Science/Calibration Packet Counts (see below) | None | Counts of packets of APID 407 (AIRS Spectral/Photometric) by condition |
| cal_reflector_dev | Unlimited Engineering Struct (see below) | GeoXTrack (= 6) | Statistics describing deviations of the viewing angle "scanang" from expected scan position for each calibration footprint position averaged over the scanlines in the granule (degrees) |
| DCRCount | 32-bit integer | None | Number of times a Direct Current Restore was executed for any module |

Size: 593 bytes (0.0 MB) per granule

Along-Track Data Fields

These fields appear once per scanline (GeoTrack times)

| Name | Type | Extra Dimensions | Explanation |
|-----------|-------------------------|------------------|--|
| satheight | 32-bit floating-point | None | Satellite altitude at nadirTAI in km above reference ellipsoid (e.g. 725.2) |
| satroll | 32-bit floating-point | None | Satellite attitude roll angle at nadirTAI (-180.0 ... 180.0 angle about the +x (roll) ORB axis, +x axis is positively oriented in the direction of orbital flight completing an orthogonal triad with y and z.) |
| satpitch | 32-bit floating-point | None | Satellite attitude pitch angle at nadirTAI (-180.0 ... 180.0 angle about +y (pitch) ORB axis. +y axis is oriented normal to the orbit plane with the positive sense opposite to that of the orbit's angular momentum vector H.) |
| satyaw | 32-bit floating-point | None | Satellite attitude yaw angle at nadirTAI (-180.0 ... 180.0 angle about +z (yaw) axis. +z axis is positively oriented earthward parallel to the satellite radius vector R from the spacecraft center of mass to the center of the Earth.) |
| satgeoqa | 32-bit unsigned integer | None | Satellite Geolocation QA flags: bit 0 (LSB): bad input value; bit 1: PGS_TD_TAItUTC() returned PGSTD_E_NO_LEAP_SECS; bit 2: PGS_TD_TAItUTC() returned PGS_E_TOOLKIT; bit 3: PGS_EPH_EphemAttit() returned PGSEPH_W_BAD_EPHEM_VALUE; bit 4: PGS_EPH_EphemAttit() returned PGSEPH_E_BAD_EPHEM_FILE_HDR; bit 5: PGS_EPH_EphemAttit() returned PGSEPH_E_NO_SC_EPHEM_FILE; bit 6: PGS_EPH_EphemAttit() returned PGSEPH_E_NO_DATA_REQUESTED; bit 7: PGS_EPH_EphemAttit() returned PGSTD_E_SC_TAG_UNKNOWN; bit 8: PGS_EPH_EphemAttit() returned PGSEPH_E_BAD_ARRAY_SIZE; bit 9: PGS_EPH_EphemAttit() returned PGSTD_E_TIME_FMT_ERROR; bit 10: PGS_EPH_EphemAttit() returned PGSTD_E_TIME_VALUE_ERROR; bit 11: PGS_EPH_EphemAttit() returned PGSTD_E_NO_LEAP_SECS; bit 12: PGS_EPH_EphemAttit() returned PGS_E_TOOLKIT; bit 13: PGS_CSC_ECIttoECR() returned PGSCSC_W_BAD_TRANSFORM_VALUE; bit 14: PGS_CSC_ECIttoECR() returned PGSCSC_E_BAD_ARRAY_SIZE; bit 15: PGS_CSC_ECIttoECR() returned PGSTD_E_NO_LEAP_SECS; bit 16: PGS_CSC_ECIttoECR() returned PGSTD_E_TIME_FMT_ERROR; bit 17: PGS_CSC_ECIttoECR() returned PGSTD_E_TIME_VALUE_ERROR; bit 18: unused (set to zero); bit 19: PGS_CSC_ECIttoECR() returned PGSTD_E_NO_UT1_VALUE; bit 20: PGS_CSC_ECIttoECR() returned PGS_E_TOOLKIT; bit 21: PGS_CSC_ECRtoGEO() returned PGSCSC_W_TOO_MANY_ITERS; bit 22: PGS_CSC_ECRtoGEO() returned PGSCSC_W_INVALID_ALTITUDE; bit 23: PGS_CSC_ECRtoGEO() returned PGSCSC_W_SPHERE_BODY; bit 24: PGS_CSC_ECRtoGEO() returned PGSCSC_W_LARGE_FLATTENING; bit 25: PGS_CSC_ECRtoGEO() returned PGSCSC_W_DEFAULT_EARTH_MODEL; bit 26: PGS_CSC_ECRtoGEO() returned PGSCSC_E_BAD_EARTH_MODEL; bit 27: PGS_CSC_ECRtoGEO() returned PGS_E_TOOLKIT; bit 28-31: not used |

| | | | |
|------------------|-------------------------|------|--|
| glintgeoqa | 16-bit unsigned integer | None | <p>Glint Geolocation QA flags: bit 0 (LSB): bad input value; bit 1: glint location in Earth's shadow; bit 2: glint calculation not converging; bit 3: glint location sun vs. satellite zenith mismatch; bit 4: glint location sun vs. satellite azimuth mismatch; bit 5: bad glint location; bit 6: PGS_CSC_ZenithAzimuth() returned any 'W' class return code; bit 7: PGS_CSC_ZenithAzimuth() returned any 'E' class return code; bit 8: PGS_CBP_Earth_CB_Vector() returned any 'W' class return code; bit 9: PGS_CBP_Earth_CB_Vector() returned any 'E' class return code; bit 10: PGS_CSC_EClttoECR() returned any 'W' class return code except PGSCSC_W_PREDICTED_UT1 (for Glint); bit 11: PGS_CSC_EClttoECR() returned any 'E' class return code (for Glint); bit 12: PGS_CSC_ECRtoGEO() returned any 'W' class return code (for Glint); bit 13: PGS_CSC_ECRtoGEO() returned any 'E' class return code (for Glint); bit 14: PGS_CSC_EClttoECR() returned any 'W' class return code except PGSCSC_W_PREDICTED_UT1 ; bit 15: PGS_CSC_EClttoECR() returned any 'E' class return code</p> |
| moongeoqa | 16-bit unsigned integer | None | <p>Moon Geolocation QA flags: bit 0 (LSB): bad input value; bit 1: PGS_TD_TAltoUTC() returned PGSTD_E_NO_LEAP_SECS; bit 2: PGS_TD_TAltoUTC() returned PGS_E_TOOLKIT; bit 3: PGS_CBP_Sat_CB_Vector() returned PGSCSC_W_BELOW_SURFACE; bit 4: PGS_CBP_Sat_CB_Vector() returned PGSCBP_W_BAD_CB_VECTOR; bit 5: PGS_CBP_Sat_CB_Vector() returned PGSCBP_E_BAD_ARRAY_SIZE; bit 6: PGS_CBP_Sat_CB_Vector() returned PGSCBP_E_INVALID_CB_ID; bit 7: PGS_CBP_Sat_CB_Vector() returned PGSMEM_E_NO_MEMORY; bit 8: PGS_CBP_Sat_CB_Vector() returned PGSCBP_E_UNABLE_TO_OPEN_FILE; bit 9: PGS_CBP_Sat_CB_Vector() returned PGSTD_E_BAD_INITIAL_TIME; bit 10: PGS_CBP_Sat_CB_Vector() returned PGSCBP_E_TIME_OUT_OF_RANGE; bit 11: PGS_CBP_Sat_CB_Vector() returned PGSTD_E_SC_TAG_UNKNOWN; bit 12: PGS_CBP_Sat_CB_Vector() returned PGSEPH_E_BAD_EPHEM_FILE_HDR; bit 13: PGS_CBP_Sat_CB_Vector() returned PGSEPH_E_NO_SC_EPHEM_FILE; bit 14: PGS_CBP_Sat_CB_Vector() returned PGS_E_TOOLKIT; bit 15: not used</p> |
| EngDataFormt1 | 16-bit unsigned integer | None | Data field format used for multiple alternate lists from HR Eng packet 1 (=13 for default (fixed format); see AIRS THB Table 4-2) |
| EngDataFormt2 | 16-bit unsigned integer | None | Data field format used for multiple alternate lists from HR Eng packet 2 (=13 for default (fixed format); see AIRS THB Table 4-2) |
| EdABIndic1 | 32-bit floating-point | None | EDC A/B Powered on Indicator (A=2.5 B=0) (Volts) |
| EdABIndic2 | 32-bit floating-point | None | EDC A/B Powered on Indicator (A=2.5 B=0) (Volts) |
| OpMode | 16-bit unsigned integer | None | Instrument Operations Mode. See AIRS Command Handbook, section 6.4 for a definition of each bit. bits 0 (LSB)-2 cal phase; bits 3-6 Cal Func; bit 7 quicklook (expedited) flag; bits 8-11 submode bits 12-14 Mode (0=standby, 1=ready, 2=operate, 3=checkout, 4=decontaminate, 5=off, 6=survival); bit 16 transition flag |
| ScOpModeCurr | 8-bit unsigned integer | None | Scanner Operating Mode - current mode. 0=Power Down; 1=Idle; 2=Find Index; 3=Scan; 4=Point; 5=Shut Down; 6=Idle/Index Found |
| ScOpModeCmded | 8-bit unsigned integer | None | Scanner Operating Mode - commanded mode. 0=Power Down; 1=Idle; 2=Find Index; 3=Scan; 4=Point; 5=Shut Down; 6=Idle/Index Found |
| RTShrdMemFail | 8-bit unsigned integer | None | Flag indicating test of remote term mem failed - bit 15 (msb) of sw status wd 1 |
| MemoryFail | 8-bit unsigned integer | None | RAM failure detected by Perform Memory Test - bit 12 of software status word 1 |
| ROMChecksumError | 8-bit unsigned integer | None | ROM checksum error detected by Perform Memory Test - bit 11 of sw status word 1 |
| RTMessgeError | 8-bit unsigned integer | None | Summit chip reported remote terminal message error - bit 9 of sw status word 1 |
| MissingEDTC | 8-bit unsigned integer | None | End of Data Transfer Cycle msg not recvd in time - bit 8 of sw status word 1 |
| MissngTimSync | 8-bit unsigned integer | None | S/C time code or sync signals missing several times - bit 7 of sw status word 1 |
| VCXOConstrErr | 8-bit unsigned integer | None | VCXO Constr Error - bit 6 of software status word 1 |
| InsClkHldgOvw | 8-bit unsigned integer | None | Flag indicating inst clock holding reg overwritten - bit 5 of sw status word 1 |
| InstClkAdjust | 8-bit unsigned integer | None | Flag indicating inst clock adjusted to s/c time signal - bit 3 of sw status wd 1 |
| ResetCause | 8-bit unsigned integer | None | Cause of the latest software reset - bits 2 - 0 (LSBs) of software status word 1 |
| ICIProtFault | 8-bit unsigned integer | None | ICI Protection Fault - bit 14 of software status word 2 |
| ICIInvalRange | 8-bit unsigned integer | None | ICI Invalid Range - bit 13 of software status word 2 |
| ICIInvChannel | 8-bit unsigned integer | None | Flag indicating invalid port number in a serial cmd - bit 11 of sw status word 2 |

| | | | |
|------------------|------------------------|-------------------|---|
| RTBITFail | 8-bit unsigned integer | None | Flag indicating remote terminal BIT test failed - bit 10 of sw status word 2 |
| AmaRelayFaild | 8-bit unsigned integer | None | Flag indicating AMA actuator selection failed - bit 14 of software status word 3 |
| AmaStepFailed | 8-bit unsigned integer | None | Actuator failed to move requested number of steps - bit 13 of sw status word 3 |
| Ama3EndState | 8-bit unsigned integer | None | AMA end state for actuator #3 - bits 12 - 10 of software status word 3 |
| Ama2EndState | 8-bit unsigned integer | None | AMA end state for actuator #2 - bits 9 - 7 of software status word 3 |
| ScnrOpnFail | 8-bit unsigned integer | None | Flag indicating scanner failed to perform as expected - bit 5 of sw status wd 2 |
| Ama1EndState | 8-bit unsigned integer | None | AMA end state for actuator #1 - bits 6 - 4 of software status word 3 |
| AmaSwStatus | 8-bit unsigned integer | None | AMA software processing state - bits 3 - 1 of software status word 3 |
| ScannrAtPoint | 8-bit unsigned integer | None | Flag indicating scanner is pointing in cmded direction - bit 0 of sw status wd 3 |
| AmaInvSwState | 8-bit unsigned integer | None | Flag indicating AMA reached an illegal state - bit 15 (msb) of sw status word 3 |
| ChPhaseErr | 32-bit floating-point | None | Chopper Phase Error (deg) |
| spacecraft_state | 8-bit integer | None | Spacecraft state (0=LNCH; 1=STBY; 2=SCI; 3=SAFE; 4=SRVL; 5-7=UNDF) (set to -1 when not known) |
| moonang | 32-bit floating-point | SpaceXTrack (= 4) | Angle (degrees) between the center of the moon and the boresight |
| ScMirrorTemp | 32-bit floating-point | None | Scan Mirror Temperature (Celcius) |
| ScHeadTemp1 | 32-bit floating-point | None | Scanner Head Housing Temperature 1 (active A or B) (Celcius) |
| CaBbTempV1 | 32-bit floating-point | None | Blackbody Temperature 1 (active CaBbTempV1A or CaBbTempV1B) (Celcius) |
| CaBbTempV2 | 32-bit floating-point | None | Blackbody Temperature 2 (active CaBbTempV2A or CaBbTempV2B) (Celcius) |
| CaBbTemp3 | 32-bit floating-point | None | Blackbody Temperature 3 (active A or B) (Celcius) |
| CaBbTemp4 | 32-bit floating-point | None | Blackbody Temperature 4 (active A or B) (Celcius) |
| SpEntFiltTmp | 32-bit floating-point | None | Spectrometer Entrance Filter temperature (active A or B) (Celcius) |
| SpOptBnchTmp2 | 32-bit floating-point | None | Spectrometer high-gain optical bench temperature 2 (active A or B) (Celcius) |
| SpOptBnchTmp3 | 32-bit floating-point | None | Spectrometer high-gain optical bench temperature 3 (active A or B) (Celcius) |
| DpPvDcRstrM3 | 8-bit integer | None | Focal Plane PV detector DC Restore (active A or B) for Module 3 (1 for DC Restore occurred) |
| DpPvDcRstrM4 | 8-bit integer | None | Focal Plane PV detector DC Restore (active A or B) for Module 4 (1 for DC Restore occurred) |
| DpPvDcRstrM5 | 8-bit integer | None | Focal Plane PV detector DC Restore (active A or B) for Module 5 (1 for DC Restore occurred) |
| DpPvDcRstrM6 | 8-bit integer | None | Focal Plane PV detector DC Restore (active A or B) for Module 6 (1 for DC Restore occurred) |
| DpPvDcRstrM7 | 8-bit integer | None | Focal Plane PV detector DC Restore (active A or B) for Module 7 (1 for DC Restore occurred) |
| DpPvDcRstrM8 | 8-bit integer | None | Focal Plane PV detector DC Restore (active A or B) for Module 8 (1 for DC Restore occurred) |
| DpPvDcRstrM9 | 8-bit integer | None | Focal Plane PV detector DC Restore (active A or B) for Module 9 (1 for DC Restore occurred) |
| DpPvDcRstrM10 | 8-bit integer | None | Focal Plane PV detector DC Restore (active A or B) for Module 10 (1 for DC Restore occurred) |
| FpDetTempVA | 32-bit floating-point | None | Focal plane IR detector temperature voltage A (Kelvins) |
| FpDetTempVB | 32-bit floating-point | None | Focal plane IR detector temperature voltage B (Kelvins) |
| SpTemperature | 32-bit floating-point | None | Spectrometer temperature (Kelvins) |
| SpGratngTemp1 | 32-bit floating-point | None | Spectrometer grating temperature 1 (active A or B) (Kelvins) |
| SpGratngTemp2 | 32-bit floating-point | None | Spectrometer grating temperature 2 (active A or B) (Kelvins) |

| | | | |
|--------------|-------------------------|------|---|
| DpCircCount | 16-bit unsigned integer | None | Data Processing circumvention counts (active A or B) (counts) |
| DpCircBasThr | 16-bit unsigned integer | None | Data Processing circumvention base threshold (active A or B) |

Size: 20520 bytes (0.0 MB) per 45-scanset granule

Full Swath Data Fields

These fields appear for every footprint of every scanline in the granule (GeoTrack * GeoXTrack times)

| Name | Type | Extra Dimensions | Explanation |
|-------------------|-------------------------|------------------|--|
| counts | 16-bit unsigned integer | Channel (= 2378) | Raw counts (data numbers) for each channel. (Note: any values received with all (12-14) bits high will be sign-extended to FF) |
| state | 32-bit integer | None | Data state: 0:Process, 1:Special, 2:Erroneous, 3:Missing |
| cal_footprint_TAI | 64-bit floating-point | None | TAI time of calibration footprint (floating-point elapsed seconds since start of 1993) |
| cal_scanang | 32-bit floating-point | None | Scanning angle of AIRS instrument for this calibration footprint (-180.0 ... 180.0, negative at start of scan, 0 at nadir) |

Size: 3865320 bytes (3.9 MB) per 45-scanset granule

**Total File Size (plus storage for dimensions and other HDF-EOS overhead):
3889673 bytes (3.9 MB) per 45-scanset granule = 933.5 MB per day**

Special AIRS Types

Unlimited Engineering Struct: This type is used for engineering data fields for which there are NOT known "yellow" limits

| Field Name | Type | Explanation |
|------------|-----------------------|---|
| min | 32-bit floating-point | Minimum value field takes on in granule (not valid when num = 0) |
| max | 32-bit floating-point | Maximum value field takes on in granule (not valid when num = 0) |
| mean | 32-bit floating-point | Mean of values field takes on in granule (not valid when num = 0) |
| dev | 32-bit floating-point | Standard Deviation of values field takes on in granule (not valid when num = 0) |
| num | 32-bit integer | Count of occurrences of field in granule (not including those counted in num_bad) |
| num_bad | 32-bit integer | Count of occasions on which field takes on invalid flag value (-9999) in granule |
| max_track | 32-bit integer | GeoTrack index (counting from 1) where max was found |
| max_xtrack | 32-bit integer | GeoXTrack index (counting from 1) where max was found |
| min_track | 32-bit integer | GeoTrack index (counting from 1) where min was found |
| min_xtrack | 32-bit integer | GeoXTrack index (counting from 1) where min was found |

AIRS Engineering Packet Counts: This type tracks counts of packets received during an interval by conditions under which they were received

| Field Name | Type | Explanation |
|--------------|----------------|---|
| missing_in | 16-bit integer | Count of packets missing between packets that are present |
| missing_ends | 16-bit integer | Count of packets missing at beginning or end of granule timespan: missing packets for which there are either no existing packets before them or no existing packets after them. (When all data is missing all packets will be counted here) |
| checksum_err | 16-bit integer | Count of packets with an error detected in the checksum |
| good | 16-bit integer | Count of packets not counted in any other category |

AIRS Science/Calibration Packet Counts: This type tracks counts of packets received during an interval by conditions under which they were received

| Field Name | Type | Explanation |
|--------------|----------------|---|
| missing_in | 16-bit integer | Count of packets missing between packets of any AIRS APID that are present |
| missing_ends | 16-bit integer | Count of packets missing at beginning or end of granule timespan: missing packets for which there are either no existing packets before them or no existing packets after them. (When all data is missing all packets will be counted here) |

| | | |
|--------------|----------------|--|
| at_noop | 16-bit integer | Count of packets for which the spacecraft mode is not operational for some or all of the packet interval |
| illegal_mode | 16-bit integer | Count of packets for which there was an illegal instrument mode |
| special_cal | 16-bit integer | Count of packets for which the instrument was in a special calibration mode |
| invalid_data | 16-bit integer | Count of invalid packets (includes missing engineering) |
| checksum_err | 16-bit integer | Count of packets with an error detected in the checksum |
| good | 16-bit integer | Count of packets not counted in any other category |

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A1-3. L1A AIRS QA Subset Interface Specification

Interface Specification Version 3.0.4.0
2003-05-19

ESDT ShortName = "AIRBAQAP"

Swath Name = "L1A_AIRS_QA_Subset"

Level = "level1A"

Footprints = 90

scanlines per scanset = 3

Dimensions

These fields define all dimensions that can be used for HDF-EOS swath fields.

The names "GeoTrack" and "GeoXTrack" have a special meaning for this document: "Cross-Track" data fields have a hidden dimension of "GeoXTrack"; "Along-Track" data fields have a hidden dimension of "GeoTrack"; "Full Swath Data Fields" have hidden dimensions of both "GeoTrack" and "GeoXTrack".

| Name | Value | Explanation |
|---------------------|--------------------------|---|
| GeoXTrack | 90 | Dimension across track for footprint positions. Same as number of footprints per scanline. -- starting at the left and increasing towards the right as you look along the satellite's path |
| GeoTrack | # of scan lines in swath | Dimension along track for footprint positions. Same as number of scanlines in granule. Parallel to the satellite's path, increasing with time. (Nominally 45 for Level-2, AMSU-A, and AIRS/Vis low-rate engineering; 135 for AIRS/Vis and HSB high-rate quantities) |
| CalXTrack | 6 | Dimension "across" track for calibration footprint positions. Same as number of calibration footprints per scanline. (NUM_FOOTPRINTS_AIRS_CALIB) (Footprints are ordered: 1-4: spaceviews (ports 3, 4, 1, 2); 5: blackbody radiometric calibration source; 6: spectral/photometric calibration sources) |
| SpaceXTrack | 4 | Dimension "across" track for spaceview calibration footprint positions in order of observation time. (NUM_FOOTPRINTS_AIRS_SPACE) |
| BBXTrack | 1 | Dimension "across" track for blackbody calibration footprint positions in order of observation time. (NUM_FOOTPRINTS_AIRS_BB) |
| GeoTrack | # of scan lines in swath | Dimension along track for footprint positions. Same as number of scanlines in granule. Parallel to the satellite's path, increasing with time. (Nominally 45 for Level-2, AMSU-A, and AIRS/Vis low-rate engineering; 135 for AIRS/Vis and HSB high-rate quantities) |
| SubTrack | 9 | VIS detector elements per AIRS footprint along track (9). Direction is the same as GeoTrack -- parallel to the satellite's path, increasing with time. (opposite order to detector ordering -- detector 0 is last) |
| SubXTrack | 8 | VIS samples per AIRS footprint across track (8). Direction is the same as GeoXTrack -- starting at the left and increasing towards the right as you look along the satellite's path |
| Bulb | 3 | Number of photometric calibration sources (light bulbs) that can be used as sources for photometric calibration (3) |
| GainHistory | 5 | Number of photometric gain calculations to store for use in smoothing of gain (5) |
| GeoLocationsPerSpot | 4 | Geolocations for the 4 corner pixels in the order: trailing first scanned; trailing last-scanned; leading first-scanned; leading last-scanned. Each footprint also has a central geolocation associated with the swath geolocation lat/lon/time of the footprint. |
| Channel | 4 | Dimension of channel array (Channel 1: ~0.40 micron; Ch 2: ~0.6 micron; Ch 3: ~0.8 micron; Ch 4: broadband) |

Geolocation Fields

These fields appear for every footprint (GeoTrack * GeoXTrack times) and correspond to footprint center coordinates and "shutter" time.

| Name | Explanation |
|-----------|--|
| Latitude | Footprint boresight geodetic Latitude in degrees North (-90.0 ... 90.0) |
| Longitude | Footprint boresight geodetic Longitude in degrees East (-180.0 ... 180.0) |
| Time | Footprint "shutter" TAI Time: floating-point elapsed seconds since Jan 1, 1993 |

Size: 291600 bytes (0.3 MB) per 45-scanset granule

Attributes

These fields appear only once per granule

| Name | Type | Extra Dimensions | Explanation |
|------------------|----------------------------|------------------|---|
| processing_level | string of 8-bit characters | None | Zero-terminated character string denoting processing level ("level1A") |
| instrument | string of 8-bit characters | None | Zero-terminated character string denoting instrument ("AIRS") |
| DayNightFlag | string of 8-bit characters | None | Zero-terminated character string denoting granule as day and/or night: (Always "Day", "Night", or "Both") |
| AutomaticQAFlag | string of 8-bit characters | None | Zero-terminated character string denoting granule data quality: (Always "Passed", "Failed", or "Suspect") |
| NumTotalData | 32-bit integer | None | Total number of expected AIRS packets |
| NumProcessData | 32-bit integer | None | Number of AIRS packets which are present and can be processed routinely (state = 0) |
| NumSpecialData | 32-bit integer | None | Number of AIRS packets which are present and can be processed only as a special test (state = 1) |
| NumBadData | 32-bit integer | None | Number of AIRS packets which are present but cannot be processed (state = 2) |
| NumMissingData | 32-bit integer | None | Number of expected AIRS packets which are not present (state = 3) |
| NumLandSurface | 32-bit integer | None | Number of scene footprints for which the surface is more than 90% land |
| NumOceanSurface | 32-bit integer | None | Number of scene footprints for which the surface is less than 10% land |
| node_type | string of 8-bit characters | None | Zero-terminated character string denoting whether granule is ascending, descending, or pole-crossing: ("Ascending" and "Descending" for entirely ascending or entirely descending granules, or "NorthPole" or "SouthPole" for pole-crossing granules) |
| start_year | 32-bit integer | None | Year in which granule started, UTC (e.g. 1999) |
| start_month | 32-bit integer | None | Month in which granule started, UTC (1 ... 12) |
| start_day | 32-bit integer | None | Day of month in which granule started, UTC (1 ... 31) |
| start_hour | 32-bit integer | None | Hour of day in which granule started, UTC (0 ... 23) |
| start_minute | 32-bit integer | None | Minute of hour in which granule started, UTC (0 ... 59) |
| start_sec | 32-bit floating-point | None | Second of minute in which granule started, UTC (0.0 ... 59.0) |
| start_orbit | 32-bit integer | None | Orbit number of mission in which granule started |
| end_orbit | 32-bit integer | None | Orbit number of mission in which granule ended |
| orbit_path | 32-bit integer | None | Orbit path of start orbit (1 ... 233 as defined by EOS project) |
| start_orbit_row | 32-bit integer | None | Orbit row at start of granule (1 ... 248 as defined by EOS project) |
| end_orbit_row | 32-bit integer | None | Orbit row at end of granule (1 ... 248 as defined by EOS project) |
| granule_number | 32-bit integer | None | Number of granule within day (1 ... 240) |
| num_scansets | 32-bit integer | None | Number of scansets in granule (1 ... 45) |
| num_scanlines | 32-bit integer | None | Number of scanlines in granule (3 * num_scansets) |
| start_Latitude | 64-bit floating-point | None | Geodetic Latitude of spacecraft at start of granule in degrees North (-90.0 ... 90.0) |
| start_Longitude | 64-bit floating-point | None | Geodetic Longitude of spacecraft at start of granule in degrees East (-180.0 ... 180.0) |
| start_Time | 64-bit floating-point | None | TAI Time at start of granule (floating-point elapsed seconds since start of 1993) |
| end_Latitude | 64-bit floating-point | None | Geodetic Latitude of spacecraft at end of granule in degrees North (-90.0 ... 90.0) |
| end_Longitude | 64-bit floating-point | None | Geodetic Longitude of spacecraft at end of granule in degrees East (-180.0 ... 180.0) |
| end_Time | 64-bit floating-point | None | TAI Time at end of granule (floating-point elapsed seconds since start of 1993) |
| eq_x_longitude | 32-bit floating-point | None | Longitude of spacecraft at southward equator crossing nearest granule start in degrees East (-180.0 ... 180.0) |
| eq_x_tai | 64-bit floating-point | None | Time of eq_x_longitude in TAI units (floating-point elapsed seconds since start of 1993) |
| orbitgeoqa | 32-bit unsigned integer | None | Orbit Geolocation QA: bit 0 (LSB): bad input value (last scanline); bit 1: bad input value (first scanline); bit 2: PGS_EPH_GetEphMet() returned PGSEPH_E_NO_SC_EPHEM_FILE; bit 3: PGS_EPH_GetEphMet() returned PGSEPH_E_BAD_ARRAY_SIZE; bit 4: PGS_EPH_GetEphMet() returned PGSTD_E_TIME_FMT_ERROR; bit 5: PGS_EPH_GetEphMet() returned PGSTD_E_TIME_VALUE_ERROR; bit 6: PGS_EPH_GetEphMet() returned PGSTD_E_SC_TAG_UNKNOWN; bit 7: PGS_EPH_GetEphMet() returned PGS_E_TOOLKIT; bit 8: PGS_TD_UTCtoTAI() returned PGSTD_E_NO_LEAP_SECS; bit 9: PGS_TD_UTCtoTAI() returned PGSTD_E_TIME_FMT_ERROR; bit 10: PGS_TD_UTCtoTAI() returned PGSTD_E_TIME_VALUE_ERROR; bit 11: PGS_TD_UTCtoTAI() returned PGS_E_TOOLKIT; bit 12: PGS_CSC_DayNight() |

| | | | |
|-------------------|--|------------------|---|
| | | | returned PGSTD_E_NO_LEAP_SECS; bit 13: PGS_CSC_DayNight() returned PGSCSC_E_INVALID_LIMITTAG; bit 14: PGS_CSC_DayNight() returned PGSCSC_E_BAD_ARRAY_SIZE; bit 15: PGS_CSC_DayNight() returned PGSCSC_W_ERROR_IN_DAYNIGHT; bit 16: PGS_CSC_DayNight() returned PGSCSC_W_BAD_TRANSFORM_VALUE; bit 17: PGS_CSC_DayNight() returned PGSCSC_W_BELOW_HORIZON; bit 18: PGS_CSC_DayNight() returned PGSCSC_W_PREDICTED_UT1; bit 19: PGS_CSC_DayNight() returned PGSTD_E_NO_UT1_VALUE; bit 20: PGS_CSC_DayNight() returned PGSTD_E_BAD_INITIAL_TIME; bit 21: PGS_CSC_DayNight() returned PGSCBP_E_TIME_OUT_OF_RANGE; bit 22: PGS_CSC_DayNight() returned PGSCBP_E_UNABLE_TO_OPEN_FILE; bit 22: PGS_CSC_DayNight() returned PGSMEM_E_NO_MEMORY; bit 24: PGS_CSC_DayNight() returned PGS_E_TOOLKIT; bit 25-31: not used |
| num_satgeoqa | 16-bit integer | None | Number of scans with problems in satgeoqa |
| num_glntgeoqa | 16-bit integer | None | Number of scans with problems in glntgeoqa |
| num_moongeoqa | 16-bit integer | None | Number of scans with problems in moongeoqa |
| num_ftptgeoqa | 16-bit integer | None | Number of footprints with problems in ftptgeoqa |
| num_zengeoqa | 16-bit integer | None | Number of footprints with problems in zengeoqa |
| num_demgeoqa | 16-bit integer | None | Number of footprints with problems in demgeoqa |
| num_fpe | 16-bit integer | None | Number of floating point errors |
| LonGranuleCen | 16-bit integer | None | Geodetic Longitude of the center of the granule in degrees East (-180 ... 180) |
| LatGranuleCen | 16-bit integer | None | Geodetic Latitude of the center of the granule in degrees North (-90 ... 90) |
| LocTimeGranuleCen | 16-bit integer | None | Local solar time at the center of the granule in minutes past midnight (0 ... 1439) |
| apid_414_cnt | AIRS Engineering Packet Counts (see below) | None | Counts of packets of APID 414 (AIRS fixed high-rate engineering 1) by condition |
| apid_415_cnt | AIRS Engineering Packet Counts (see below) | None | Counts of packets of APID 415 (AIRS fixed high-rate engineering 2) by condition |
| apid_416_cnt | AIRS Engineering Packet Counts (see below) | None | Counts of packets of APID 416 (AIRS flexible high-rate engineering 1) by condition |
| apid_417_cnt | AIRS Engineering Packet Counts (see below) | None | Counts of packets of APID 417 (AIRS flexible high-rate engineering 2) by condition |
| reflector_dev | Unlimited Engineering Struct (see below) | GeoXTrack (= 90) | Statistics describing deviations of the viewing angle "scanang" from expected scan position for each footprint position averaged over the scanlines in the granule (degrees) |
| apid_404_cnt | AIRS Science/Calibration Packet Counts (see below) | None | Counts of packets of APID 404 (AIRS Science) by condition |
| apid_405_cnt | AIRS Science/Calibration Packet Counts (see below) | None | Counts of packets of APID 405 (AIRS Space) by condition |
| apid_406_cnt | AIRS Science/Calibration Packet Counts (see below) | None | Counts of packets of APID 406 (AIRS Blackbody) by condition |
| apid_407_cnt | AIRS Science/Calibration Packet Counts (see below) | None | Counts of packets of APID 407 (AIRS Spectral/Photometric) by condition |
| DCRCount | 32-bit integer | None | Number of times a Direct Current Restore was executed for any module |
| HasPhotoCal | 32-bit integer | None | 1 if granule includes any scans with photometric calibration lamps on, 0 otherwise |
| xtrack_err | 32-bit floating-point | Channel (= 4) | cross-track pixel location error estimate per channel (km) |
| track_err | 32-bit floating-point | Channel (= 4) | Along-track pixel location error estimate per channel (km) |
| align_1_2_nadir | 32-bit floating-point | None | Expected error (km) between the pixel locations for the corner locations of near-nadir AIRS footprints (45 & 46) between VIS channels 1 & 2 |
| align_2_3_nadir | 32-bit floating-point | None | Expected error (km) between the pixel locations for the corner locations of near-nadir AIRS footprints (45 & 46) between VIS channels 2 & 3 |
| align_2_4_nadir | 32-bit floating-point | None | Expected error (km) between the pixel locations for the corner locations of near-nadir AIRS footprints (45 & 46) between VIS channels 2 & 4 |
| align_1_2_maxang | 32-bit floating-point | None | Expected error (km) between the pixel locations for the corner locations of near-limb AIRS footprints (1 & 90) between VIS channels 1 & 2 |

| | | | |
|-------------------|--|-----------------|--|
| align_2_3_maxang | 32-bit floating-point | None | Expected error (km) between the pixel locations for the corner locations of near-limb AIRS footprints (1 & 90) between VIS channels 2 & 3 |
| align_2_4_maxang | 32-bit floating-point | None | Expected error (km) between the pixel locations for the corner locations of near-limb AIRS footprints (1 & 90) between VIS channels 2 & 4 |
| align_vis_airs | 32-bit floating-point | None | Expected error (km) between the pixel locations for the corner locations of near-nadir AIRS footprints (45 & 46) between the AIRS center and all VIS channels |
| cal_reflector_dev | Unlimited Engineering Struct (see below) | CalXTrack (= 6) | Statistics describing deviations of the viewing angle "scanang" from expected scan position for each calibration footprint position averaged over the scanlines in the granule (degrees) |

Size: 5713 bytes (0.0 MB) per granule

Along-Track Data Fields

These fields appear once per scanline (GeoTrack times)

| Name | Type | Extra Dimensions | Explanation |
|------------|-------------------------|------------------|--|
| satheight | 32-bit floating-point | None | Satellite altitude at nadirTAI in km above reference ellipsoid (e.g. 725.2) |
| satroll | 32-bit floating-point | None | Satellite attitude roll angle at nadirTAI (-180.0 ... 180.0 angle about the +x (roll) ORB axis, +x axis is positively oriented in the direction of orbital flight completing an orthogonal triad with y and z.) |
| satpitch | 32-bit floating-point | None | Satellite attitude pitch angle at nadirTAI (-180.0 ... 180.0 angle about +y (pitch) ORB axis. +y axis is oriented normal to the orbit plane with the positive sense opposite to that of the orbit's angular momentum vector H.) |
| satyaw | 32-bit floating-point | None | Satellite attitude yaw angle at nadirTAI (-180.0 ... 180.0 angle about +z (yaw) axis. +z axis is positively oriented earthward parallel to the satellite radius vector R from the spacecraft center of mass to the center of the Earth.) |
| satgeoqa | 32-bit unsigned integer | None | Satellite Geolocation QA flags: bit 0 (LSB): bad input value; bit 1: PGS_TD_TAtoUTC() returned PGSTD_E_NO_LEAP_SECS; bit 2: PGS_TD_TAtoUTC() returned PGS_E_TOOLKIT; bit 3: PGS_EPH_EphemAttit() returned PGSEPH_W_BAD_EPHEM_VALUE; bit 4: PGS_EPH_EphemAttit() returned PGSEPH_E_BAD_EPHEM_FILE_HDR; bit 5: PGS_EPH_EphemAttit() returned PGSEPH_E_NO_SC_EPHEM_FILE; bit 6: PGS_EPH_EphemAttit() returned PGSEPH_E_NO_DATA_REQUESTED; bit 7: PGS_EPH_EphemAttit() returned PGSTD_E_SC_TAG_UNKNOWN; bit 8: PGS_EPH_EphemAttit() returned PGSEPH_E_BAD_ARRAY_SIZE; bit 9: PGS_EPH_EphemAttit() returned PGSTD_E_TIME_FMT_ERROR; bit 10: PGS_EPH_EphemAttit() returned PGSTD_E_TIME_VALUE_ERROR; bit 11: PGS_EPH_EphemAttit() returned PGSTD_E_NO_LEAP_SECS; bit 12: PGS_EPH_EphemAttit() returned PGS_E_TOOLKIT; bit 13: PGS_CSC_ECtoECR() returned PGSCSC_W_BAD_TRANSFORM_VALUE; bit 14: PGS_CSC_ECtoECR() returned PGSCSC_E_BAD_ARRAY_SIZE; bit 15: PGS_CSC_ECtoECR() returned PGSTD_E_NO_LEAP_SECS; bit 16: PGS_CSC_ECtoECR() returned PGSTD_E_TIME_FMT_ERROR; bit 17: PGS_CSC_ECtoECR() returned PGSTD_E_TIME_VALUE_ERROR; bit 18: unused (set to zero); bit 19: PGS_CSC_ECtoECR() returned PGSTD_E_NO_UT1_VALUE; bit 20: PGS_CSC_ECtoECR() returned PGS_E_TOOLKIT; bit 21: PGS_CSC_ECRtoGEO() returned PGSCSC_W_TOO_MANY_ITERS; bit 22: PGS_CSC_ECRtoGEO() returned PGSCSC_W_INVALID_ALTITUDE; bit 23: PGS_CSC_ECRtoGEO() returned PGSCSC_W_SPHERE_BODY; bit 24: PGS_CSC_ECRtoGEO() returned PGSCSC_W_LARGE_FLATTENING; bit 25: PGS_CSC_ECRtoGEO() returned PGSCSC_W_DEFAULT_EARTH_MODEL; bit 26: PGS_CSC_ECRtoGEO() returned PGSCSC_E_BAD_EARTH_MODEL; bit 27: PGS_CSC_ECRtoGEO() returned PGS_E_TOOLKIT; bit 28-31: not used |
| glintgeoqa | 16-bit unsigned integer | None | Glint Geolocation QA flags: bit 0 (LSB): bad input value; bit 1: glint location in Earth's shadow; bit 2: glint calculation not converging; bit 3: glint location sun vs. satellite zenith mismatch; bit 4: glint location sun vs. satellite azimuth mismatch; bit 5: bad glint location; bit 6: PGS_CSC_ZenithAzimuth() returned any 'W' class return code; bit 7: PGS_CSC_ZenithAzimuth() returned any 'E' class return code; bit 8: PGS_CBP_Earth_CB_Vector() returned returned any 'W' class return code; bit 9: PGS_CBP_Earth_CB_Vector() returned returned any 'E' class return code; bit 10: PGS_CSC_ECtoECR() returned any 'W' class return code except PGSCSC_W_PREDICTED_UT1 (for Glint); bit 11: PGS_CSC_ECtoECR() returned any 'E' class return code (for Glint); bit 12: PGS_CSC_ECRtoGEO() returned any 'W' class return code (for Glint); bit 13: PGS_CSC_ECRtoGEO() returned any 'E' class return code (for Glint); bit 14: PGS_CSC_ECtoECR() returned any 'W' class return code except PGSCSC_W_PREDICTED_UT1; bit 15: PGS_CSC_ECtoECR() returned any 'E' class return code |
| moongeoqa | 16-bit unsigned integer | None | Moon Geolocation QA flags: bit 0 (LSB): bad input value; bit 1: PGS_TD_TAtoUTC() returned PGSTD_E_NO_LEAP_SECS; bit 2: PGS_TD_TAtoUTC() returned PGS_E_TOOLKIT; bit 3: PGS_CBP_Sat_CB_Vector() returned PGSCSC_W_BELOW_SURFACE; bit 4: PGS_CBP_Sat_CB_Vector() returned PGSCBP_W_BAD_CB_VECTOR; bit 5: PGS_CBP_Sat_CB_Vector() returned PGSCBP_E_BAD_ARRAY_SIZE; bit 6: PGS_CBP_Sat_CB_Vector() returned PGSCBP_E_INVALID_CB_ID; bit 7: PGS_CBP_Sat_CB_Vector() returned PGSMEM_E_NO_MEMORY; bit 8: PGS_CBP_Sat_CB_Vector() returned PGSCBP_E_UNABLE_TO_OPEN_FILE; bit 9: PGS_CBP_Sat_CB_Vector() returned PGSTD_E_BAD_INITIAL_TIME; bit 10: PGS_CBP_Sat_CB_Vector() returned PGSCBP_E_TIME_OUT_OF_RANGE; bit 11: PGS_CBP_Sat_CB_Vector() returned PGSTD_E_SC_TAG_UNKNOWN; bit 12: PGS_CBP_Sat_CB_Vector() returned PGSEPH_E_BAD_EPHEM_FILE_HDR; bit 13: PGS_CBP_Sat_CB_Vector() returned PGSEPH_E_NO_SC_EPHEM_FILE; bit 14: PGS_CBP_Sat_CB_Vector() returned PGS_E_TOOLKIT; bit 15: not used |

| | | | |
|------------------|-------------------------|------|---|
| nadirTAI | 64-bit floating-point | None | TAI time at which instrument is nominally looking directly down. (between footprints 15 & 16 for AMSU or between footprints 45 & 46 for AIRS/Vis & HSB) (floating-point elapsed seconds since start of 1993) |
| sat_lat | 64-bit floating-point | None | Satellite geodetic latitude in degrees North (-90.0 ... 90.0) |
| sat_lon | 64-bit floating-point | None | Satellite geodetic longitude in degrees East (-180.0 ... 180.0) |
| scan_node_type | 8-bit integer | None | 'A' for ascending, 'D' for descending, 'N' for North-Polar, 'S' for South-Polar |
| EngDataFmt1 | 16-bit unsigned integer | None | Data field format used for multiple alternate lists from HR Eng packet 1 (=13 for default (fixed format); see AIRS THB Table 4-2) |
| EngDataFmt2 | 16-bit unsigned integer | None | Data field format used for multiple alternate lists from HR Eng packet 2 (=13 for default (fixed format); see AIRS THB Table 4-2) |
| EdABIndic1 | 32-bit floating-point | None | EDC A/B Powered on Indicator (A=2.5 B=0) (Volts) |
| EdABIndic2 | 32-bit floating-point | None | EDC A/B Powered on Indicator (A=2.5 B=0) (Volts) |
| OpMode | 16-bit unsigned integer | None | Instrument Operations Mode. See AIRS Command Handbook, section 6.4 for a definition of each bit. bits 0 (LSB)-2 cal phase; bits 3-6 Cal Func; bit 7 quicklook (expedited) flag; bits 8-11 submode bits 12-14 Mode (0=standby, 1=ready, 2=operate, 3=checkout, 4=decontaminate, 5=off, 6=survival); bit 16 transition flag |
| ScOpModeCurr | 8-bit unsigned integer | None | Scanner Operating Mode - current mode. 0=Power Down; 1=Idle; 2=Find Index; 3=Scan; 4=Point; 5=Shut Down; 6=Idle/Index Found |
| ScOpModeCmdd | 8-bit unsigned integer | None | Scanner Operating Mode - commanded mode. 0=Power Down; 1=Idle; 2=Find Index; 3=Scan; 4=Point; 5=Shut Down; 6=Idle/Index Found |
| RTShrdMemFail | 8-bit unsigned integer | None | Flag indicating test of remote term mem failed - bit 15 (msb) of sw status wd 1 |
| MemoryFail | 8-bit unsigned integer | None | RAM failure detected by Perform Memory Test - bit 12 of software status word 1 |
| ROMChecksumError | 8-bit unsigned integer | None | ROM checksum error detected by Perform Memory Test - bit 11 of sw status word 1 |
| RTMessgeError | 8-bit unsigned integer | None | Summit chip reported remote terminal message error - bit 9 of sw status word 1 |
| MissingEDTC | 8-bit unsigned integer | None | End of Data Transfer Cycle msg not recvd in time - bit 8 of sw status word 1 |
| MissngTimSync | 8-bit unsigned integer | None | S/C time code or sync signals missing several times - bit 7 of sw status word 1 |
| VCXOConstrErr | 8-bit unsigned integer | None | VCXO Constr Error - bit 6 of software status word 1 |
| InsClkHldgOvw | 8-bit unsigned integer | None | Flag indicating inst clock holding reg overwritten - bit 5 of sw status word 1 |
| InstClkAdjust | 8-bit unsigned integer | None | Flag indicating inst clock adjusted to s/c time signal - bit 3 of sw status wd 1 |
| ResetCause | 8-bit unsigned integer | None | Cause of the latest software reset - bits 2 - 0 (LSBs) of software status word 1 |
| ICIProtFault | 8-bit unsigned integer | None | ICI Protection Fault - bit 14 of software status word 2 |
| ICIInvalRange | 8-bit unsigned integer | None | ICI Invalid Range - bit 13 of software status word 2 |
| ICInvChannel | 8-bit unsigned integer | None | Flag indicating invalid port number in a serial cmd - bit 11 of sw status word 2 |
| RTBITFail | 8-bit unsigned integer | None | Flag indicating remote terminal BIT test failed - bit 10 of sw status word 2 |
| AmaRelayFaild | 8-bit unsigned integer | None | Flag indicating AMA actuator selection failed - bit 14 of software status word 3 |
| AmaStepFailed | 8-bit unsigned integer | None | Actuator failed to move requested number of steps - bit 13 of sw status word 3 |
| Ama3EndState | 8-bit unsigned integer | None | AMA end state for actuator #3 - bits 12 - 10 of software status word 3 |
| Ama2EndState | 8-bit unsigned integer | None | AMA end state for actuator #2 - bits 9 - 7 of software status word 3 |
| ScnrOpnFail | 8-bit unsigned integer | None | Flag indicating scanner failed to perform as expected - bit 5 of sw status wd 2 |
| Ama1EndState | 8-bit unsigned integer | None | AMA end state for actuator #1 - bits 6 - 4 of software status word 3 |

| | | | |
|------------------|-------------------------|-------------------|---|
| | integer | | |
| AmaSwStatus | 8-bit unsigned integer | None | AMA software processing state - bits 3 - 1 of software status word 3 |
| ScannrAtPoint | 8-bit unsigned integer | None | Flag indicating scanner is pointing in cmded direction - bit 0 of sw status wd 3 |
| AmaInvSwState | 8-bit unsigned integer | None | Flag indicating AMA reached an illegal state - bit 15 (msb) of sw status word 3 |
| ChPhaseErr | 32-bit floating-point | None | Chopper Phase Error (deg) |
| spacecraft_state | 8-bit integer | None | Spacecraft state (0=LNCH; 1=STBY; 2=SCI; 3=SAFE; 4=SRVL; 5-7=UNDF) (set to -1 when not known) |
| moonang | 32-bit floating-point | SpaceXTrack (= 4) | Angle (degrees) between the center of the moon and the boresight |
| DpCircCount | 16-bit unsigned integer | None | Data Processing circumvention counts (active A or B) (counts) |
| DpCircBasThr | 16-bit unsigned integer | None | Data Processing circumvention base threshold (active A or B) |
| ViSnsrArrTemp | 32-bit floating-point | None | Vis/NIR Sensor Array Temperature (Celcius) |
| ScHeadTemp1 | 32-bit floating-point | None | Scanner Head Housing Temperature 1 (active A or B) (Celcius) |
| ViPowerVolt | 32-bit floating-point | None | Vis/NIR Power Voltage (not redundant) (Volts) |
| PhoPowerVolt | 32-bit floating-point | None | Photo calibrator power voltage (not redundant) (volts) |
| PhotoCalOn | 32-bit floating-point | None | Photo calibrator power on (0.0 = off 3.75 = on) (not redundant) (volts) |
| PhoCalLamp1On | 32-bit floating-point | None | Photo calibrator lamp 1 on (0.0 = not 4.5 = sel) (not redundant) (volts) |
| PhoCalLamp2On | 32-bit floating-point | None | Photo calibrator lamp 2 on (0.0 = not 4.5 = sel) (not redundant) (volts) |
| PhoCalLamp3On | 32-bit floating-point | None | Photo calibrator lamp 3 on (0.0 = not 4.5 = sel) (not redundant) (volts) |

Size: 19575 bytes (0.0 MB) per 45-scanset granule

Full Swath Data Fields

These fields appear for every footprint of every scanline in the granule (GeoTrack * GeoXTrack times)

| Name | Type | Extra Dimensions | Explanation |
|-----------|-------------------------|------------------|---|
| ftptgeoqa | 32-bit unsigned integer | None | Footprint Geolocation QA flags: bit 0 (LSB): bad input value; bit 1: PGS_TD_TAltoUTC() returned PGSTD_E_NO_LEAP_SECS; bit 2: PGS_TD_TAltoUTC() returned PGS_E_TOOLKIT; bit 3: PGS_CSC_GetFOV_Pixel() returned PGSCSC_W_MISS_EARTH; bit 4: PGS_CSC_GetFOV_Pixel() returned PGSTD_E_SC_TAG_UNKNOWN; bit 5: PGS_CSC_GetFOV_Pixel() returned PGSCSC_W_ZERO_PIXEL_VECTOR; bit 6: PGS_CSC_GetFOV_Pixel() returned PGSCSC_W_BAD_EPH_FOR_PIXEL; bit 7: PGS_CSC_GetFOV_Pixel() returned PGSCSC_W_INSTRUMENT_OFF_BOARD; bit 8: PGS_CSC_GetFOV_Pixel() returned PGSCSC_W_BAD_ACCURACY_FLAG; bit 9: PGS_CSC_GetFOV_Pixel() returned PGSCSC_E_BAD_ARRAY_SIZE; bit 10: PGS_CSC_GetFOV_Pixel() returned PGSCSC_W_DEFAULT_EARTH_MODEL; bit 11: PGS_CSC_GetFOV_Pixel() returned PGSCSC_W_DATA_FILE_MISSING; bit 12: PGS_CSC_GetFOV_Pixel() returned PGSCSC_E_NEG_OR_ZERO_RAD; bit 13: PGS_CSC_GetFOV_Pixel() returned PGSMEM_E_NO_MEMORY; bit 14: PGS_CSC_GetFOV_Pixel() returned PGSTD_E_NO_LEAP_SECS; bit 15: PGS_CSC_GetFOV_Pixel() returned PGSTD_E_TIME_FMT_ERROR; bit 16: PGS_CSC_GetFOV_Pixel() returned PGSTD_E_TIME_VALUE_ERROR; bit 17: PGS_CSC_GetFOV_Pixel() returned PGSCSC_W_PREDICTED_UT1; bit 18: PGS_CSC_GetFOV_Pixel() returned PGSTD_E_NO_UT1_VALUE; bit 19: PGS_CSC_GetFOV_Pixel() returned PGS_E_TOOLKIT; bit 20: PGS_CSC_GetFOV_Pixel() returned PGSEPH_E_BAD_EPHEM_FILE_HDR; bit 21: PGS_CSC_GetFOV_Pixel() returned PGSEPH_E_NO_SC_EPHEM_FILE; bit 22-31: not used |
| zengeoqa | 16-bit unsigned integer | None | Satellite zenith Geolocation QA flags: bit 0 (LSB): (Spacecraft) bad input value; bit 1: PGS_CSC_ZenithAzimuth(S/C) returned PGSCSC_W_BELOW_HORIZON; bit 2: PGS_CSC_ZenithAzimuth(S/C) returned PGSCSC_W_UNDEFINED_AZIMUTH; bit 3: PGS_CSC_ZenithAzimuth(S/C) returned PGSCSC_W_NO_REFRACTION; bit 4: PGS_CSC_ZenithAzimuth(S/C) returned PGSCSC_E_INVALID_VECTAG; bit 5: PGS_CSC_ZenithAzimuth(S/C) returned PGSCSC_E_LOOK_PT_ALTIT_RANGE; bit 6: PGS_CSC_ZenithAzimuth(S/C) returned PGSCSC_E_ZERO_INPUT_VECTOR; bit 7: PGS_CSC_ZenithAzimuth(S/C) returned PGS_E_TOOLKIT; bit 8: (Sun) bad input value; bit 9: (suppressed) PGS_CSC_ZenithAzimuth(Sun) returned PGSCSC_W_BELOW_HORIZON (This is not an error condition - the sun is below the horizon at night); bit 10: PGS_CSC_ZenithAzimuth(Sun) returned PGSCSC_W_UNDEFINED_AZIMUTH; bit 11: PGS_CSC_ZenithAzimuth(Sun) returned PGSCSC_W_NO_REFRACTION; bit 12: PGS_CSC_ZenithAzimuth(Sun) returned |

| | | | |
|----------|-------------------------|------|--|
| | | | PGSCSC_E_INVALID_VECTAG; bit 13: PGS_CSC_ZenithAzimuth(Sun) returned PGSCSC_E_LOOK_PT_ALTIT_RANGE; bit 14: PGS_CSC_ZenithAzimuth(Sun) returned PGSCSC_E_ZERO_INPUT_VECTOR; bit 15: PGS_CSC_ZenithAzimuth(Sun) returned PGS_E_TOOLKIT |
| demgeoqa | 16-bit unsigned integer | None | Digital Elevation Model (DEM) Geolocation QA flags: bit 0 (LSB): bad input value; bit 1: Could not allocate memory; bit 2: Too close to North or South pole. Excluded; bit 3: Layer resolution incompatibility. Excluded; bit 4: Any DEM Routine (elev) returned PGSDM_E_IMPROPER_TAG; bit 5: Any DEM Routine (elev) returned PGSDM_E_CANNOT_ACCESS_DATA; bit 6: Any DEM Routine (land/water) returned PGSDM_E_IMPROPER_TAG; bit 7: Any DEM Routine (land/water) returned PGSDM_E_CANNOT_ACCESS_DATA; bit 8: Reserved for future layers; bit 9: Reserved for future layers; bit 10: PGS_DEM_GetRegion(elev) returned PGSDM_M_FILLVALUE_INCLUDED; bit 11: PGS_DEM_GetRegion(land/water) returned PGSDM_M_FILLVALUE_INCLUDED; bit 12: Reserved for future layers; bit 13: PGS_DEM_GetRegion(all) returned PGSDM_M_MULTIPLE_RESOLUTIONS; bit 14: PGS_CSC_GetFOV_Pixel() returned any 'W' class return code except PGSCSC_W_PREDICTED_UT1; bit 15: PGS_CSC_GetFOV_Pixel() returned any 'E' class return code |
| state | 32-bit integer | None | Data state: 0:Process, 1:Special, 2:Erroneous, 3:Missing |

Size: 145800 bytes (0.1 MB) per 45-scanset granule

Calibration Swath Data Fields

These fields appear for every calibration footprint of every scanline in the granule (GeoTrack * CalXTrack times)

| Name | Type | Extra Dimensions | Explanation |
|-------------------|-----------------------|------------------|--|
| cal_state | 32-bit integer | None | Data state: 0:Process, 1:Special, 2:Erroneous, 3:Missing |
| cal_footprint_TAI | 64-bit floating-point | None | TAI time of calibration footprint (floating-point elapsed seconds since start of 1993) |

Size: 9720 bytes (0.0 MB) per 45-scanset granule

Total File Size (plus storage for dimensions and other HDF-EOS overhead): 472408 bytes (0.5 MB) per 45-scanset granule = 113.4 MB per day

Special AIRS Types

Unlimited Engineering Struct: This type is used for engineering data fields for which there are NOT known "yellow" limits

| Field Name | Type | Explanation |
|------------|-----------------------|---|
| min | 32-bit floating-point | Minimum value field takes on in granule (not valid when num = 0) |
| max | 32-bit floating-point | Maximum value field takes on in granule (not valid when num = 0) |
| mean | 32-bit floating-point | Mean of values field takes on in granule (not valid when num = 0) |
| dev | 32-bit floating-point | Standard Deviation of values field takes on in granule (not valid when num = 0) |
| num | 32-bit integer | Count of occurrences of field in granule (not including those counted in num_bad) |
| num_bad | 32-bit integer | Count of occasions on which field takes on invalid flag value (-9999) in granule |
| max_track | 32-bit integer | GeoTrack index (counting from 1) where max was found |
| max_xtrack | 32-bit integer | GeoXTrack index (counting from 1) where max was found |
| min_track | 32-bit integer | GeoTrack index (counting from 1) where min was found |
| min_xtrack | 32-bit integer | GeoXTrack index (counting from 1) where min was found |

AIRS Engineering Packet Counts: This type tracks counts of packets received during an interval by conditions under which they were received

| Field Name | Type | Explanation |
|--------------|----------------|---|
| missing_in | 16-bit integer | Count of packets missing between packets that are present |
| missing_ends | 16-bit integer | Count of packets missing at beginning or end of granule timespan: missing packets for which there are either no existing packets before them or no existing packets after them. (When all data is missing all packets will be counted here) |
| checksum_err | 16-bit integer | Count of packets with an error detected in the checksum |
| good | 16-bit integer | Count of packets not counted in any other category |

AIRS Science/Calibration Packet Counts: This type tracks counts of packets received during an interval by conditions under which they were received

| Field Name | Type | Explanation |
|------------|----------------|--|
| missing_in | 16-bit integer | Count of packets missing between packets of any AIRS APID that are present |

| | | |
|--------------|----------------|---|
| missing_ends | 16-bit integer | Count of packets missing at beginning or end of granule timespan: missing packets for which there are either no existing packets before them or no existing packets after them. (When all data is missing all packets will be counted here) |
| at_noop | 16-bit integer | Count of packets for which the spacecraft mode is not operational for some or all of the packet interval |
| illegal_mode | 16-bit integer | Count of packets for which there was an illegal instrument mode |
| special_cal | 16-bit integer | Count of packets for which the instrument was in a special calibration mode |
| invalid_data | 16-bit integer | Count of invalid packets (includes missing engineering) |
| checksum_err | 16-bit integer | Count of packets with an error detected in the checksum |
| good | 16-bit integer | Count of packets not counted in any other category |

A1-4. L1A VISIBLE/NIR Science Interface Specification

Interface Specification Version 3.0.4.0
2003-05-19

ESDT ShortName = "AIRVASCI"

Swath Name = "L1A_VIS_Science"

Level = "level1A"

Footprints = 90

scanlines per scanset = 3

Dimensions

These fields define all dimensions that can be used for HDF-EOS swath fields.

The names "GeoTrack" and "GeoXTrack" have a special meaning for this document: "Cross-Track" data fields have a hidden dimension of "GeoXTrack"; "Along-Track" data fields have a hidden dimension of "GeoTrack"; "Full Swath Data Fields" have hidden dimensions of both "GeoTrack" and "GeoXTrack".

| Name | Value | Explanation |
|---------------------|--------------------------|---|
| GeoXTrack | 90 | Dimension across track for footprint positions. Same as number of footprints per scanline. -- starting at the left and increasing towards the right as you look along the satellite's path |
| GeoTrack | # of scan lines in swath | Dimension along track for footprint positions. Same as number of scanlines in granule. Parallel to the satellite's path, increasing with time. (Nominally 45 for Level-2, AMSU-A, and AIRS/Vis low-rate engineering; 135 for AIRS/Vis and HSB high-rate quantities) |
| SubTrack | 9 | VIS detector elements per AIRS footprint along track (9). Direction is the same as GeoTrack -- parallel to the satellite's path, increasing with time. (opposite order to detector ordering -- detector 0 is last) |
| SubXTrack | 8 | VIS samples per AIRS footprint across track (8). Direction is the same as GeoXTrack -- starting at the left and increasing towards the right as you look along the satellite's path |
| Bulb | 3 | Number of photometric calibration sources (light bulbs) that can be used as sources for photometric calibration (3) |
| GainHistory | 5 | Number of photometric gain calculations to store for use in smoothing of gain (5) |
| GeoLocationsPerSpot | 4 | Geolocations for the 4 corner pixels in the order: trailing first scanned; trailing last-scanned; leading first-scanned; leading last-scanned. Each footprint also has a central geolocation associated with the swath geolocation lat/lon/time of the footprint. |
| Channel | 4 | Dimension of channel array (Channel 1: ~0.40 micron; Ch 2: ~0.6 micron; Ch 3: ~0.8 micron; Ch 4: broadband) |

Geolocation Fields

These fields appear for every footprint (GeoTrack * GeoXTrack times) and correspond to footprint center coordinates and "shutter" time.

| Name | Explanation |
|-----------|--|
| Latitude | Footprint boresight geodetic Latitude in degrees North (-90.0 ... 90.0) |
| Longitude | Footprint boresight geodetic Longitude in degrees East (-180.0 ... 180.0) |
| Time | Footprint "shutter" TAI Time: floating-point elapsed seconds since Jan 1, 1993 |

Size: 291600 bytes (0.3 MB) per 45-scanset granule

Attributes

These fields appear only once per granule

| Name | Type | Extra Dimensions | Explanation |
|------------------|----------------------------|------------------|---|
| processing_level | string of 8-bit characters | None | Zero-terminated character string denoting processing level ("level1A") |
| instrument | string of 8-bit characters | None | Zero-terminated character string denoting instrument ("VIS") |
| DayNightFlag | string of 8-bit characters | None | Zero-terminated character string denoting granule as day and/or night: (Always "Day", "Night", or "Both") |
| AutomaticQAFlag | string of 8-bit characters | None | Zero-terminated character string denoting granule data quality: (Always "Passed", "Failed", or "Suspect") |
| NumTotalData | 32-bit integer | None | Total number of expected AIRS packets |

| | | | |
|-----------------|----------------------------|------|---|
| NumProcessData | 32-bit integer | None | Number of AIRS packets which are present and can be processed routinely (state = 0) |
| NumSpecialData | 32-bit integer | None | Number of AIRS packets which are present and can be processed only as a special test (state = 1) |
| NumBadData | 32-bit integer | None | Number of AIRS packets which are present but cannot be processed (state = 2) |
| NumMissingData | 32-bit integer | None | Number of expected AIRS packets which are not present (state = 3) |
| NumLandSurface | 32-bit integer | None | Number of scene footprints for which the surface is more than 90% land |
| NumOceanSurface | 32-bit integer | None | Number of scene footprints for which the surface is less than 10% land |
| node_type | string of 8-bit characters | None | Zero-terminated character string denoting whether granule is ascending, descending, or pole-crossing: "Ascending" and "Descending" for entirely ascending or entirely descending granules, or "NorthPole" or "SouthPole" for pole-crossing granules) |
| start_year | 32-bit integer | None | Year in which granule started, UTC (e.g. 1999) |
| start_month | 32-bit integer | None | Month in which granule started, UTC (1 ... 12) |
| start_day | 32-bit integer | None | Day of month in which granule started, UTC (1 ... 31) |
| start_hour | 32-bit integer | None | Hour of day in which granule started, UTC (0 ... 23) |
| start_minute | 32-bit integer | None | Minute of hour in which granule started, UTC (0 ... 59) |
| start_sec | 32-bit floating-point | None | Second of minute in which granule started, UTC (0.0 ... 59.0) |
| start_orbit | 32-bit integer | None | Orbit number of mission in which granule started |
| end_orbit | 32-bit integer | None | Orbit number of mission in which granule ended |
| orbit_path | 32-bit integer | None | Orbit path of start orbit (1 ... 233 as defined by EOS project) |
| start_orbit_row | 32-bit integer | None | Orbit row at start of granule (1 ... 248 as defined by EOS project) |
| end_orbit_row | 32-bit integer | None | Orbit row at end of granule (1 ... 248 as defined by EOS project) |
| granule_number | 32-bit integer | None | Number of granule within day (1 ... 240) |
| num_scansets | 32-bit integer | None | Number of scansets in granule (1 ... 45) |
| num_scanlines | 32-bit integer | None | Number of scanlines in granule (3 * num_scansets) |
| start_Latitude | 64-bit floating-point | None | Geodetic Latitude of spacecraft at start of granule in degrees North (-90.0 ... 90.0) |
| start_Longitude | 64-bit floating-point | None | Geodetic Longitude of spacecraft at start of granule in degrees East (-180.0 ... 180.0) |
| start_Time | 64-bit floating-point | None | TAI Time at start of granule (floating-point elapsed seconds since start of 1993) |
| end_Latitude | 64-bit floating-point | None | Geodetic Latitude of spacecraft at end of granule in degrees North (-90.0 ... 90.0) |
| end_Longitude | 64-bit floating-point | None | Geodetic Longitude of spacecraft at end of granule in degrees East (-180.0 ... 180.0) |
| end_Time | 64-bit floating-point | None | TAI Time at end of granule (floating-point elapsed seconds since start of 1993) |
| eq_x_longitude | 32-bit floating-point | None | Longitude of spacecraft at southward equator crossing nearest granule start in degrees East (-180.0 ... 180.0) |
| eq_x_tai | 64-bit floating-point | None | Time of eq_x_longitude in TAI units (floating-point elapsed seconds since start of 1993) |
| orbitgeoqa | 32-bit unsigned integer | None | Orbit Geolocation QA: bit 0 (LSB): bad input value (last scanline); bit 1: bad input value (first scanline); bit 2: PGS_EPH_GetEphMet() returned PGSEPH_E_NO_SC_EPHEM_FILE; bit 3: PGS_EPH_GetEphMet() returned PGSEPH_E_BAD_ARRAY_SIZE; bit 4: PGS_EPH_GetEphMet() returned PGSTD_E_TIME_FMT_ERROR; bit 5: PGS_EPH_GetEphMet() returned PGSTD_E_TIME_VALUE_ERROR; bit 6: PGS_EPH_GetEphMet() returned PGSTD_E_SC_TAG_UNKNOWN; bit 7: PGS_EPH_GetEphMet() returned PGS_E_TOOLKIT; bit 8: PGS_TD_UTCToTAI() returned PGSTD_E_NO_LEAP_SECS; bit 9: PGS_TD_UTCToTAI() returned PGSTD_E_TIME_FMT_ERROR; bit 10: PGS_TD_UTCToTAI() returned PGSTD_E_TIME_VALUE_ERROR; bit 11: PGS_TD_UTCToTAI() returned PGS_E_TOOLKIT; bit 12: PGS_CSC_DayNight() returned PGSTD_E_NO_LEAP_SECS; bit 13: PGS_CSC_DayNight() returned PGSCSC_E_INVALID_LIMITTAG; bit 14: PGS_CSC_DayNight() returned PGSCSC_E_BAD_ARRAY_SIZE; bit 15: PGS_CSC_DayNight() returned PGSCSC_W_ERROR_IN_DAYNIGHT; bit 16: PGS_CSC_DayNight() returned PGSCSC_W_BAD_TRANSFORM_VALUE; bit 17: PGS_CSC_DayNight() returned PGSCSC_W_BELOW_HORIZON; bit 18: PGS_CSC_DayNight() returned PGSCSC_W_PREDICTED_UT1; bit 19: PGS_CSC_DayNight() returned PGSTD_E_NO_UT1_VALUE; bit 20: PGS_CSC_DayNight() returned PGSTD_E_BAD_INITIAL_TIME; bit 21: PGS_CSC_DayNight() returned PGSCBP_E_TIME_OUT_OF_RANGE; bit 22: PGS_CSC_DayNight() returned PGSCBP_E_UNABLE_TO_OPEN_FILE; bit 23: PGS_CSC_DayNight() returned PGSMEM_E_NO_MEMORY; bit 24: PGS_CSC_DayNight() returned PGS_E_TOOLKIT; bit 25-31: not used |
| num_satgeoqa | 16-bit integer | None | Number of scans with problems in satgeoqa |
| num_glintgeoqa | 16-bit integer | None | Number of scans with problems in glintgeoqa |
| num_moongeoqa | 16-bit integer | None | Number of scans with problems in moongeoqa |

| | | | |
|-------------------|--|------------------|--|
| num_ftptgeoqa | 16-bit integer | None | Number of footprints with problems in ftptgeoqa |
| num_zengeoqa | 16-bit integer | None | Number of footprints with problems in zengeoqa |
| num_demgeoqa | 16-bit integer | None | Number of footprints with problems in demgeoqa |
| num_fpe | 16-bit integer | None | Number of floating point errors |
| LonGranuleCen | 16-bit integer | None | Geodetic Longitude of the center of the granule in degrees East (-180 ... 180) |
| LatGranuleCen | 16-bit integer | None | Geodetic Latitude of the center of the granule in degrees North (-90 ... 90) |
| LocTimeGranuleCen | 16-bit integer | None | Local solar time at the center of the granule in minutes past midnight (0 ... 1439) |
| xtrack_err | 32-bit floating-point | Channel (= 4) | cross-track pixel location error estimate per channel (km) |
| track_err | 32-bit floating-point | Channel (= 4) | Along-track pixel location error estimate per channel (km) |
| align_1_2_nadir | 32-bit floating-point | None | Expected error (km) between the pixel locations for the corner locations of near-nadir AIRS footprints (45 & 46) between VIS channels 1 & 2 |
| align_2_3_nadir | 32-bit floating-point | None | Expected error (km) between the pixel locations for the corner locations of near-nadir AIRS footprints (45 & 46) between VIS channels 2 & 3 |
| align_2_4_nadir | 32-bit floating-point | None | Expected error (km) between the pixel locations for the corner locations of near-nadir AIRS footprints (45 & 46) between VIS channels 2 & 4 |
| align_1_2_maxang | 32-bit floating-point | None | Expected error (km) between the pixel locations for the corner locations of near-limb AIRS footprints (1 & 90) between VIS channels 1 & 2 |
| align_2_3_maxang | 32-bit floating-point | None | Expected error (km) between the pixel locations for the corner locations of near-limb AIRS footprints (1 & 90) between VIS channels 2 & 3 |
| align_2_4_maxang | 32-bit floating-point | None | Expected error (km) between the pixel locations for the corner locations of near-limb AIRS footprints (1 & 90) between VIS channels 2 & 4 |
| align_vis_airs | 32-bit floating-point | None | Expected error (km) between the pixel locations for the corner locations of near-nadir AIRS footprints (45 & 46) between the AIRS center and all VIS channels |
| apid_414_cnt | AIRS Engineering Packet Counts (see below) | None | Counts of packets of APID 414 (AIRS fixed high-rate engineering 1) by condition |
| apid_415_cnt | AIRS Engineering Packet Counts (see below) | None | Counts of packets of APID 415 (AIRS fixed high-rate engineering 2) by condition |
| apid_416_cnt | AIRS Engineering Packet Counts (see below) | None | Counts of packets of APID 416 (AIRS flexible high-rate engineering 1) by condition |
| apid_417_cnt | AIRS Engineering Packet Counts (see below) | None | Counts of packets of APID 417 (AIRS flexible high-rate engineering 2) by condition |
| reflector_dev | Unlimited Engineering Struct (see below) | GeoXTrack (= 90) | Statistics describing deviations of the viewing angle "scanang" from expected scan position for each footprint position averaged over the scanlines in the granule (degrees) |
| apid_404_cnt | AIRS Science/Calibration Packet Counts (see below) | None | Counts of packets of APID 404 (AIRS Science) by condition |

Size: 5321 bytes (0.0 MB) per granule

Along-Track Data Fields

These fields appear once per scanline (GeoTrack times)

| Name | Type | Extra Dimensions | Explanation |
|-----------|-------------------------|------------------|---|
| satheight | 32-bit floating-point | None | Satellite altitude at nadirTAI in km above reference ellipsoid (e.g. 725.2) |
| satroll | 32-bit floating-point | None | Satellite attitude roll angle at nadirTAI (-180.0 ... 180.0 angle about the +x (roll) ORB axis, +x axis is positively oriented in the direction of orbital flight completing an orthogonal triad with y and z.) |
| satpitch | 32-bit floating-point | None | Satellite attitude pitch angle at nadirTAI (-180.0 ... 180.0 angle about +y (pitch) ORB axis, +y axis is oriented normal to the orbit plane with the positive sense opposite to that of the orbit's angular momentum vector H.) |
| satyaw | 32-bit floating-point | None | Satellite attitude yaw angle at nadirTAI (-180.0 ... 180.0 angle about +z (yaw) axis, +z axis is positively oriented earthward parallel to the satellite radius vector R from the spacecraft center of mass to the center of the Earth.) |
| satgeoqa | 32-bit unsigned integer | None | Satellite Geolocation QA flags: bit 0 (LSB): bad input value; bit 1: PGS_TD_TAItUTC() returned PGSTD_E_NO_LEAP_SECS; bit 2: PGS_TD_TAItUTC() returned PGS_E_TOOLKIT; bit 3: PGS_EPH_EphemAttit() returned PGSEPH_W_BAD_EPHEM_VALUE; bit 4: PGS_FPH_FphemAttit() returned PGSEPH_F_BAD_FPHM_FIL_FHDR; bit 5: |

| | | | |
|----------------|-------------------------|------|---|
| | | | PGS_EPH_EphemAttit() returned PGSEPH_E_NO_SC_EPHEM_FILE; bit 6: PGS_EPH_EphemAttit() returned PGSEPH_E_NO_DATA_REQUESTED; bit 7: PGS_EPH_EphemAttit() returned PGSTD_E_SC_TAG_UNKNOWN; bit 8: PGS_EPH_EphemAttit() returned PGSEPH_E_BAD_ARRAY_SIZE; bit 9: PGS_EPH_EphemAttit() returned PGSTD_E_TIME_FMT_ERROR; bit 10: PGS_EPH_EphemAttit() returned PGSTD_E_TIME_VALUE_ERROR; bit 11: PGS_EPH_EphemAttit() returned PGSTD_E_NO_LEAP_SECS; bit 12: PGS_EPH_EphemAttit() returned PGS_E_TOOLKIT; bit 13: PGS_CSC_ECIttoECR() returned PGSCSC_W_BAD_TRANSFORM_VALUE; bit 14: PGS_CSC_ECIttoECR() returned PGSCSC_E_BAD_ARRAY_SIZE; bit 15: PGS_CSC_ECIttoECR() returned PGSTD_E_NO_LEAP_SECS; bit 16: PGS_CSC_ECIttoECR() returned PGSTD_E_TIME_FMT_ERROR; bit 17: PGS_CSC_ECIttoECR() returned PGSTD_E_TIME_VALUE_ERROR; bit 18: unused (set to zero); bit 19: PGS_CSC_ECIttoECR() returned PGSTD_E_NO_UT1_VALUE; bit 20: PGS_CSC_ECIttoECR() returned PGS_E_TOOLKIT; bit 21: PGS_CSC_ECRtoGEO() returned PGSCSC_W_TOO_MANY_ITERS; bit 22: PGS_CSC_ECRtoGEO() returned PGSCSC_W_INVALID_ALTITUDE; bit 23: PGS_CSC_ECRtoGEO() returned PGSCSC_W_SPHERE_BODY; bit 24: PGS_CSC_ECRtoGEO() returned PGSCSC_W_LARGE_FLATTENING; bit 25: PGS_CSC_ECRtoGEO() returned PGSCSC_W_DEFAULT_EARTH_MODEL; bit 26: PGS_CSC_ECRtoGEO() returned PGSCSC_E_BAD_EARTH_MODEL; bit 27: PGS_CSC_ECRtoGEO() returned PGS_E_TOOLKIT; bit 28-31: not used |
| glintgeoqa | 16-bit unsigned integer | None | Glnt Geolocation QA flags: bit 0 (LSB): bad input value; bit 1: glint location in Earth's shadow; bit 2: glint calculation not converging; bit 3: glint location sun vs. satellite zenith mismatch; bit 4: glint location sun vs. satellite azimuth mismatch; bit 5: bad glint location; bit 6: PGS_CSC_ZenithAzimuth() returned any 'W' class return code; bit 7: PGS_CSC_ZenithAzimuth() returned any 'E' class return code; bit 8: PGS_CBP_Earth_CB_Vector() returned any 'W' class return code; bit 9: PGS_CBP_Earth_CB_Vector() returned any 'E' class return code; bit 10: PGS_CSC_ECIttoECR() returned any 'W' class return code except PGSCSC_W_PREDICTED_UT1 (for Glnt); bit 11: PGS_CSC_ECIttoECR() returned any 'E' class return code (for Glnt); bit 12: PGS_CSC_ECRtoGEO() returned any 'W' class return code (for Glnt); bit 13: PGS_CSC_ECRtoGEO() returned any 'E' class return code (for Glnt); bit 14: PGS_CSC_ECIttoECR() returned any 'W' class return code except PGSCSC_W_PREDICTED_UT1; bit 15: PGS_CSC_ECIttoECR() returned any 'E' class return code |
| moongeoqa | 16-bit unsigned integer | None | Moon Geolocation QA flags: bit 0 (LSB): bad input value; bit 1: PGS_TD_TAltoUTC() returned PGSTD_E_NO_LEAP_SECS; bit 2: PGS_TD_TAltoUTC() returned PGS_E_TOOLKIT; bit 3: PGS_CBP_Sat_CB_Vector() returned PGSCBP_W_BELOW_SURFACE; bit 4: PGS_CBP_Sat_CB_Vector() returned PGSCBP_W_BAD_CB_VECTOR; bit 5: PGS_CBP_Sat_CB_Vector() returned PGSCBP_E_BAD_ARRAY_SIZE; bit 6: PGS_CBP_Sat_CB_Vector() returned PGSCBP_E_INVALID_CB_ID; bit 7: PGS_CBP_Sat_CB_Vector() returned PGSMEM_E_NO_MEMORY; bit 8: PGS_CBP_Sat_CB_Vector() returned PGSCBP_E_UNABLE_TO_OPEN_FILE; bit 9: PGS_CBP_Sat_CB_Vector() returned PGSTD_E_BAD_INITIAL_TIME; bit 10: PGS_CBP_Sat_CB_Vector() returned PGSCBP_E_TIME_OUT_OF_RANGE; bit 11: PGS_CBP_Sat_CB_Vector() returned PGSTD_E_SC_TAG_UNKNOWN; bit 12: PGS_CBP_Sat_CB_Vector() returned PGSEPH_E_BAD_EPHEM_FILE_HDR; bit 13: PGS_CBP_Sat_CB_Vector() returned PGSEPH_E_NO_SC_EPHEM_FILE; bit 14: PGS_CBP_Sat_CB_Vector() returned PGS_E_TOOLKIT; bit 15: not used |
| nadirTAI | 64-bit floating-point | None | TAI time at which instrument is nominally looking directly down. (between footprints 15 & 16 for AMSU or between footprints 45 & 46 for AIRS/Vis & HSB) (floating-point elapsed seconds since start of 1993) |
| sat_lat | 64-bit floating-point | None | Satellite geodetic latitude in degrees North (-90.0 ... 90.0) |
| sat_lon | 64-bit floating-point | None | Satellite geodetic longitude in degrees East (-180.0 ... 180.0) |
| scan_node_type | 8-bit integer | None | 'A' for ascending, 'D' for descending, 'N' for North-Polar, 'S' for South-Polar |
| glintlat | 32-bit floating-point | None | Solar glint geodetic latitude in degrees North at nadirTAI (-90.0 ... 90.0) |
| glintlon | 32-bit floating-point | None | Solar glint geodetic longitude in degrees East at nadirTAI (-180.0 ... 180.0) |
| EngDataFmt1 | 16-bit unsigned integer | None | Data field format used for multiple alternate lists from HR Eng packet 1 (=13 for default (fixed format); see AIRS THB Table 4-2) |
| EngDataFmt2 | 16-bit unsigned integer | None | Data field format used for multiple alternate lists from HR Eng packet 2 (=13 for default (fixed format); see AIRS THB Table 4-2) |
| EdABIndic1 | 32-bit floating-point | None | EDC A/B Powered on Indicator (A=2.5 B=0) (Volts) |
| EdABIndic2 | 32-bit floating-point | None | EDC A/B Powered on Indicator (A=2.5 B=0) (Volts) |
| OpMode | 16-bit unsigned integer | None | Instrument Operations Mode. See AIRS Command Handbook, section 6.4 for a definition of each bit. bits 0 (LSB)-2 cal phase; bits 3-6 Cal Func; bit 7 quicklook (expedited) flag; bits 8-11 submode bits 12-14 Mode (0=standby, 1=ready, 2=operate, 3=checkout, 4=decontaminate, 5=off, 6=survival); bit 16 transition flag |
| ScOpModeCurr | 8-bit unsigned integer | None | Scanner Operating Mode - current mode. 0=Power Down; 1=Idle; 2=Find Index; 3=Scan; 4=Point; 5=Shut Down; 6=Idle/Index Found |
| ScOpModeCmded | 8-bit unsigned | None | Scanner Operating Mode - commanded mode. 0=Power Down; 1=Idle; 2=Find Index; 3=Scan; |

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|------------------|------------------------|------|---|
| | integer | | 4=Point; 5=Shut Down; 6=Idle/Index Found |
| RTShrdMemFail | 8-bit unsigned integer | None | Flag indicating test of remote term mem failed - bit 15 (msb) of sw status wd 1 |
| MemoryFail | 8-bit unsigned integer | None | RAM failure detected by Perform Memory Test - bit 12 of software status word 1 |
| ROMChecksumError | 8-bit unsigned integer | None | ROM checksum error detected by Perform Memory Test - bit 11 of sw status word 1 |
| RTMessgeError | 8-bit unsigned integer | None | Summit chip reported remote terminal message error - bit 9 of sw status word 1 |
| MissingEDTC | 8-bit unsigned integer | None | End of Data Transfer Cycle msg not recvd in time - bit 8 of sw status word 1 |
| MissngTimSync | 8-bit unsigned integer | None | S/C time code or sync signals missing several times - bit 7 of sw status word 1 |
| VCXOConstrErr | 8-bit unsigned integer | None | VCXO Constr Error - bit 6 of software status word 1 |
| InsClkHldgOvw | 8-bit unsigned integer | None | Flag indicating inst clock holding reg overwritten - bit 5 of sw status word 1 |
| InstClkAdjust | 8-bit unsigned integer | None | Flag indicating inst clock adjusted to s/c time signal - bit 3 of sw status wd 1 |
| ResetCause | 8-bit unsigned integer | None | Cause of the latest software reset - bits 2 - 0 (LSBs) of software status word 1 |
| ICIProtFault | 8-bit unsigned integer | None | ICI Protection Fault - bit 14 of software status word 2 |
| ICInvalRange | 8-bit unsigned integer | None | ICI Invalid Range - bit 13 of software status word 2 |
| ICInvChannel | 8-bit unsigned integer | None | Flag indicating invalid port number in a serial cmd - bit 11 of sw status word 2 |
| RTBITFail | 8-bit unsigned integer | None | Flag indicating remote terminal BIT test failed - bit 10 of sw status word 2 |
| AmaRelayFaild | 8-bit unsigned integer | None | Flag indicating AMA actuator selection failed - bit 14 of software status word 3 |
| AmaStepFailed | 8-bit unsigned integer | None | Actuator failed to move requested number of steps - bit 13 of sw status word 3 |
| Ama3EndState | 8-bit unsigned integer | None | AMA end state for actuator #3 - bits 12 - 10 of software status word 3 |
| Ama2EndState | 8-bit unsigned integer | None | AMA end state for actuator #2 - bits 9 - 7 of software status word 3 |
| ScnrOpnFail | 8-bit unsigned integer | None | Flag indicating scanner failed to perform as expected - bit 5 of sw status wd 2 |
| Ama1EndState | 8-bit unsigned integer | None | AMA end state for actuator #1 - bits 6 - 4 of software status word 3 |
| AmaSwStatus | 8-bit unsigned integer | None | AMA software processing state - bits 3 - 1 of software status word 3 |
| ScannrAtPoint | 8-bit unsigned integer | None | Flag indicating scanner is pointing in cmded direction - bit 0 of sw status wd 3 |
| AmaInvSwState | 8-bit unsigned integer | None | Flag indicating AMA reached an illegal state - bit 15 (msb) of sw status word 3 |
| ChPhaseErr | 32-bit floating-point | None | Chopper Phase Error (deg) |
| spacecraft_state | 8-bit integer | None | Spacecraft state (0=LNCH; 1=STBY; 2=SCI; 3=SAFE; 4=SRVL; 5-7=UNDF) (set to -1 when not known) |

Size: 13635 bytes (0.0 MB) per 45-scanset granule

Full Swath Data Fields

These fields appear for every footprint of every scanline in the granule (GeoTrack * GeoXTrack times)

| Name | Type | Extra Dimensions | Explanation |
|-----------|-------------------------|------------------|--|
| scanang | 32-bit floating-point | None | Scanning angle of AIRS instrument with respect to the AIRS instrument for this footprint (-180.0 ... 180.0, negative at start of scan, 0 at nadir) |
| ftptgeoqa | 32-bit unsigned integer | None | Footprint Geolocation QA flags: bit 0 (LSB): bad input value; bit 1: PGS_TD_TAtoUTC() returned PGSTD_E_NO_LEAP_SECS; bit 2: PGS_TD_TAtoUTC() returned PGS_E_TOOLKIT; bit 3: PGS_CSC_GetFOV_Pixel() returned PGSCSC_W_MISS_EARTH; bit 4: PGS_CSC_GetFOV_Pixel() returned PGSTD_E_SC_TAG_UNKNOWN; bit 5: PGS_CSC_GetFOV_Pixel() returned PGSCSC_W_ZERO_PIXEL_VECTOR; bit 6: PGS_CSC_GetFOV_Pixel() returned PGSCSC_W_RAD_FPH_FOR_PIXEL; bit 7: PGS_CSC_GetFOV_Pixel() returned |

| | | | |
|--------------------|-------------------------|--|--|
| | | | PGSCSC_W_INSTRUMENT_OFF_BOARD; bit 8: PGS_CSC_GetFOV_Pixel() returned PGSCSC_W_BAD_ACCURACY_FLAG; bit 9: PGS_CSC_GetFOV_Pixel() returned PGSCSC_E_BAD_ARRAY_SIZE; bit 10: PGS_CSC_GetFOV_Pixel() returned PGSCSC_W_DEFAULT_EARTH_MODEL; bit 11: PGS_CSC_GetFOV_Pixel() returned PGSCSC_W_DATA_FILE_MISSING; bit 12: PGS_CSC_GetFOV_Pixel() returned PGSCSC_E_NEG_OR_ZERO_RAD; bit 13: PGS_CSC_GetFOV_Pixel() returned PGSMEM_E_NO_MEMORY; bit 14: PGS_CSC_GetFOV_Pixel() returned PGSTD_E_NO_LEAP_SECS; bit 15: PGS_CSC_GetFOV_Pixel() returned PGSTD_E_TIME_FMT_ERROR; bit 16: PGS_CSC_GetFOV_Pixel() returned PGSTD_E_TIME_VALUE_ERROR; bit 17: PGS_CSC_GetFOV_Pixel() returned PGSCSC_W_PREDICTED_UT1; bit 18: PGS_CSC_GetFOV_Pixel() returned PGSTD_E_NO_UT1_VALUE; bit 19: PGS_CSC_GetFOV_Pixel() returned PGS_E_TOOLKIT; bit 20: PGS_CSC_GetFOV_Pixel() returned PGSEPH_E_BAD_EPHEM_FILE_HDR; bit 21: PGS_CSC_GetFOV_Pixel() returned PGSEPH_E_NO_SC_EPHEM_FILE; bit 22-31: not used |
| zengeoqa | 16-bit unsigned integer | None | Satellite zenith Geolocation QA flags: bit 0 (LSB): (Spacecraft) bad input value; bit 1: PGS_CSC_ZenithAzimuth(S/C) returned PGSCSC_W_BELOW_HORIZON; bit 2: PGS_CSC_ZenithAzimuth(S/C) returned PGSCSC_W_UNDEFINED_AZIMUTH; bit 3: PGS_CSC_ZenithAzimuth(S/C) returned PGSCSC_W_NO_REFRACTION; bit 4: PGS_CSC_ZenithAzimuth(S/C) returned PGSCSC_E_INVALID_VECTAG; bit 5: PGS_CSC_ZenithAzimuth(S/C) returned PGSCSC_E_LOOK_PT_ALTIT_RANGE; bit 6: PGS_CSC_ZenithAzimuth(S/C) returned PGSCSC_E_ZERO_INPUT_VECTOR; bit 7: PGS_CSC_ZenithAzimuth(S/C) returned PGS_E_TOOLKIT; bit 8: (Sun) bad input value; bit 9: (suppressed) PGS_CSC_ZenithAzimuth(Sun) returned PGSCSC_W_BELOW_HORIZON (This is not an error condition - the sun is below the horizon at night); bit 10: PGS_CSC_ZenithAzimuth(Sun) returned PGSCSC_W_UNDEFINED_AZIMUTH; bit 11: PGS_CSC_ZenithAzimuth(Sun) returned PGSCSC_W_NO_REFRACTION; bit 12: PGS_CSC_ZenithAzimuth(Sun) returned PGSCSC_E_INVALID_VECTAG; bit 13: PGS_CSC_ZenithAzimuth(Sun) returned PGSCSC_E_LOOK_PT_ALTIT_RANGE; bit 14: PGS_CSC_ZenithAzimuth(Sun) returned PGSCSC_E_ZERO_INPUT_VECTOR; bit 15: PGS_CSC_ZenithAzimuth(Sun) returned PGS_E_TOOLKIT |
| demgeoqa | 16-bit unsigned integer | None | Digital Elevation Model (DEM) Geolocation QA flags: bit 0 (LSB): bad input value; bit 1: Could not allocate memory; bit 2: Too close to North or South pole. Excluded; bit 3: Layer resolution incompatibility. Excluded; bit 4: Any DEM Routine (elev) returned PGSDM_E_IMPROPER_TAG; bit 5: Any DEM Routine (elev) returned PGSDM_E_CANNOT_ACCESS_DATA; bit 6: Any DEM Routine (land/water) returned PGSDM_E_IMPROPER_TAG; bit 7: Any DEM Routine (land/water) returned PGSDM_E_CANNOT_ACCESS_DATA; bit 8: Reserved for future layers; bit 9: Reserved for future layers; bit 10: PGS_DEM_GetRegion(elev) returned PGSDM_M_FILLVALUE_INCLUDED; bit 11: PGS_DEM_GetRegion(land/water) returned PGSDM_M_FILLVALUE_INCLUDED; bit 12: Reserved for future layers; bit 13: PGS_DEM_GetRegion(all) returned PGSDM_M_MULTIPLE_RESOLUTIONS; bit 14: PGS_CSC_GetFOV_Pixel() returned any 'W' class return code except PGSCSC_W_PREDICTED_UT1; bit 15: PGS_CSC_GetFOV_Pixel() returned any 'E' class return code |
| satzen | 32-bit floating-point | None | Spacecraft zenith angle (0.0 ... 180.0) degrees from zenith (measured relative to the geodetic vertical on the reference (WGS84) spheroid and including corrections outlined in EOS SDP toolkit for normal accuracy.) |
| satazi | 32-bit floating-point | None | Spacecraft azimuth angle (-180.0 ... 180.0) degrees E of N GEO) |
| solzen | 32-bit floating-point | None | Solar zenith angle (0.0 ... 180.0) degrees from zenith (measured relative to the geodetic vertical on the reference (WGS84) spheroid and including corrections outlined in EOS SDP toolkit for normal accuracy.) |
| solazi | 32-bit floating-point | None | Solar azimuth angle (-180.0 ... 180.0) degrees E of N GEO) |
| sun_glint_distance | 16-bit integer | None | Distance (km) from footprint center to location of the sun glint (-9999 for unknown, 30000 for no glint visible because spacecraft is in Earth's shadow) |
| topog | 32-bit floating-point | None | Mean topography in meters above reference ellipsoid |
| topog_err | 32-bit floating-point | None | Error estimate for topog |
| landFrac | 32-bit floating-point | None | Fraction of spot that is land (0.0 ... 1.0) |
| landFrac_err | 32-bit floating-point | None | Error estimate for landFrac |
| counts | 16-bit unsigned integer | Channel (= 4) * SubTrack (= 9) * SubXTrack (= 8) | Raw counts (data numbers) for each channel |
| state | 32-bit integer | None | Data state: 0:Process, 1:Special, 2:Erroneous, 3:Missing |
| cornerlats | 32-bit floating-point | GeoLocationsPerSpot (= 4) * Channel (= 4) | Geodetic Latitudes at the centers of the pixels at the corners of the IR footprint by channel in degrees North (-90.0 ... 90.0) |
| cornerlons | 32-bit floating-point | GeoLocationsPerSpot (= 4) * Channel (= 4) | Geodetic Longitudes at the centers of the pixels at the corners of the IR footprint by channel in degrees East (-180.0 ... 180.0) |

Size: 9161100 bytes (9.2 MB) per 45-scanset granule

**Total File Size (plus storage for dimensions and other HDF-EOS overhead):
9471656 bytes (9.5 MB) per 45-scanset granule = 2273.2 MB per day**

Special AIRS Types

Unlimited Engineering Struct: This type is used for engineering data fields for which there are NOT known "yellow" limits

| Field Name | Type | Explanation |
|------------|-----------------------|---|
| min | 32-bit floating-point | Minimum value field takes on in granule (not valid when num = 0) |
| max | 32-bit floating-point | Maximum value field takes on in granule (not valid when num = 0) |
| mean | 32-bit floating-point | Mean of values field takes on in granule (not valid when num = 0) |
| dev | 32-bit floating-point | Standard Deviation of values field takes on in granule (not valid when num = 0) |
| num | 32-bit integer | Count of occurrences of field in granule (not including those counted in num_bad) |
| num_bad | 32-bit integer | Count of occasions on which field takes on invalid flag value (-9999) in granule |
| max_track | 32-bit integer | GeoTrack index (counting from 1) where max was found |
| max_xtrack | 32-bit integer | GeoXTrack index (counting from 1) where max was found |
| min_track | 32-bit integer | GeoTrack index (counting from 1) where min was found |
| min_xtrack | 32-bit integer | GeoXTrack index (counting from 1) where min was found |

AIRS Engineering Packet Counts: This type tracks counts of packets received during an interval by conditions under which they were received

| Field Name | Type | Explanation |
|--------------|----------------|---|
| missing_in | 16-bit integer | Count of packets missing between packets that are present |
| missing_ends | 16-bit integer | Count of packets missing at beginning or end of granule timespan: missing packets for which there are either no existing packets before them or no existing packets after them. (When all data is missing all packets will be counted here) |
| checksum_err | 16-bit integer | Count of packets with an error detected in the checksum |
| good | 16-bit integer | Count of packets not counted in any other category |

AIRS Science/Calibration Packet Counts: This type tracks counts of packets received during an interval by conditions under which they were received

| Field Name | Type | Explanation |
|--------------|----------------|---|
| missing_in | 16-bit integer | Count of packets missing between packets of any AIRS APID that are present |
| missing_ends | 16-bit integer | Count of packets missing at beginning or end of granule timespan: missing packets for which there are either no existing packets before them or no existing packets after them. (When all data is missing all packets will be counted here) |
| at_noop | 16-bit integer | Count of packets for which the spacecraft mode is not operational for some or all of the packet interval |
| illegal_mode | 16-bit integer | Count of packets for which there was an illegal instrument mode |
| special_cal | 16-bit integer | Count of packets for which the instrument was in a special calibration mode |
| invalid_data | 16-bit integer | Count of invalid packets (includes missing engineering) |
| checksum_err | 16-bit integer | Count of packets with an error detected in the checksum |
| good | 16-bit integer | Count of packets not counted in any other category |

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A1-5. L1A VISIBLE/NIR Calibration Interface Specification

Interface Specification Version 3.0.4.0
2003-05-19

ESDT ShortName = "AIRVACAL"

Swath Name = "L1A_VIS_Calibration"

Level = "level1A"

Footprints = 6

scanlines per scanset = 3

Dimensions

These fields define all dimensions that can be used for HDF-EOS swath fields.

The names "GeoTrack" and "GeoXTrack" have a special meaning for this document: "Cross-Track" data fields have a hidden dimension of "GeoXTrack"; "Along-Track" data fields have a hidden dimension of "GeoTrack"; "Full Swath Data Fields" have hidden dimensions of both "GeoTrack" and "GeoXTrack".

| Name | Value | Explanation |
|---------------------|--------------------------|---|
| GeoXTrack | 6 | Dimension "across" track for calibration footprint positions. Same as number of calibration footprints per scanline. (NUM_FOOTPRINTS_AIRS_CALIB) (Footprints are ordered: 1-4: spaceviews (ports 3, 4, 1, 2); 5: blackbody radiometric calibration source; 6: spectral/photometric calibration sources) |
| SpaceXTrack | 4 | Dimension "across" track for spaceview calibration footprint positions in order of observation time. (NUM_FOOTPRINTS_AIRS_SPACE) |
| BBXTrack | 1 | Dimension "across" track for blackbody calibration footprint positions in order of observation time. (NUM_FOOTPRINTS_AIRS_BB) |
| GeoTrack | # of scan lines in swath | Dimension along track for footprint positions. Same as number of scanlines in granule. Parallel to the satellite's path, increasing with time. (Nominally 45 for Level-2, AMSU-A, and AIRS/Vis low-rate engineering; 135 for AIRS/Vis and HSB high-rate quantities) |
| SubTrack | 9 | VIS detector elements per AIRS footprint along track (9). Direction is the same as GeoTrack -- parallel to the satellite's path, increasing with time. (opposite order to detector ordering -- detector 0 is last) |
| SubXTrack | 8 | VIS samples per AIRS footprint across track (8). Direction is the same as GeoXTrack -- starting at the left and increasing towards the right as you look along the satellite's path |
| Bulb | 3 | Number of photometric calibration sources (light bulbs) that can be used as sources for photometric calibration (3) |
| GainHistory | 5 | Number of photometric gain calculations to store for use in smoothing of gain (5) |
| GeoLocationsPerSpot | 4 | Geolocations for the 4 corner pixels in the order: trailing first scanned; trailing last-scanned; leading first-scanned; leading last-scanned. Each footprint also has a central geolocation associated with the swath geolocation lat/lon/time of the footprint. |
| Channel | 4 | Dimension of channel array (Channel 1: ~0.40 micron; Ch 2: ~0.6 micron; Ch 3: ~0.8 micron; Ch 4: broadband) |

Geolocation Fields

These fields appear once per scanline and correspond to satellite coordinates at time of nadir view

| Name | Explanation |
|-----------|---|
| Latitude | Spacecraft geodetic Latitude at nadirTAI in degrees North (-90.0 ... 90.0) |
| Longitude | Spacecraft geodetic Longitude at nadirTAI in degrees East (-180.0 ... 180.0) |
| Time | nadirTAI: time of nadir view (half-way between footprints 45 & 46) floating-point elapsed seconds since Jan 1, 1993 |

Size: 3240 bytes (0.0 MB) per 45-scanset granule

Attributes

These fields appear only once per granule

| Name | Type | Extra Dimensions | Explanation |
|------------------|----------------------------|------------------|--|
| processing_level | string of 8-bit characters | None | Zero-terminated character string denoting processing level ("level1A") |
| instrument | string of 8-bit characters | None | Zero-terminated character string denoting instrument ("VIS") |
| DayNightFlag | string of 8-bit | None | Zero-terminated character string denoting granule as day and/or night: (Always |

| | | | |
|-----------------|----------------------------|------|---|
| | characters | | "Day", "Night", or "Both") |
| AutomaticQAFlag | string of 8-bit characters | None | Zero-terminated character string denoting granule data quality: (Always "Passed", "Failed", or "Suspect") |
| NumTotalData | 32-bit integer | None | Total number of expected AIRS packets |
| NumProcessData | 32-bit integer | None | Number of AIRS packets which are present and can be processed routinely (state = 0) |
| NumSpecialData | 32-bit integer | None | Number of AIRS packets which are present and can be processed only as a special test (state = 1) |
| NumBadData | 32-bit integer | None | Number of AIRS packets which are present but cannot be processed (state = 2) |
| NumMissingData | 32-bit integer | None | Number of expected AIRS packets which are not present (state = 3) |
| NumLandSurface | 32-bit integer | None | Number of scene footprints for which the surface is more than 90% land |
| NumOceanSurface | 32-bit integer | None | Number of scene footprints for which the surface is less than 10% land |
| node_type | string of 8-bit characters | None | Zero-terminated character string denoting whether granule is ascending, descending, or pole-crossing: ("Ascending" and "Descending" for entirely ascending or entirely descending granules, or "NorthPole" or "SouthPole" for pole-crossing granules) |
| start_year | 32-bit integer | None | Year in which granule started, UTC (e.g. 1999) |
| start_month | 32-bit integer | None | Month in which granule started, UTC (1 ... 12) |
| start_day | 32-bit integer | None | Day of month in which granule started, UTC (1 ... 31) |
| start_hour | 32-bit integer | None | Hour of day in which granule started, UTC (0 ... 23) |
| start_minute | 32-bit integer | None | Minute of hour in which granule started, UTC (0 ... 59) |
| start_sec | 32-bit floating-point | None | Second of minute in which granule started, UTC (0.0 ... 59.0) |
| start_orbit | 32-bit integer | None | Orbit number of mission in which granule started |
| end_orbit | 32-bit integer | None | Orbit number of mission in which granule ended |
| orbit_path | 32-bit integer | None | Orbit path of start orbit (1 ... 233 as defined by EOS project) |
| start_orbit_row | 32-bit integer | None | Orbit row at start of granule (1 ... 248 as defined by EOS project) |
| end_orbit_row | 32-bit integer | None | Orbit row at end of granule (1 ... 248 as defined by EOS project) |
| granule_number | 32-bit integer | None | Number of granule within day (1 ... 240) |
| num_scansets | 32-bit integer | None | Number of scansets in granule (1 ... 45) |
| num_scanlines | 32-bit integer | None | Number of scanlines in granule (3 * num_scansets) |
| start_Latitude | 64-bit floating-point | None | Geodetic Latitude of spacecraft at start of granule in degrees North (-90.0 ... 90.0) |
| start_Longitude | 64-bit floating-point | None | Geodetic Longitude of spacecraft at start of granule in degrees East (-180.0 ... 180.0) |
| start_Time | 64-bit floating-point | None | TAI Time at start of granule (floating-point elapsed seconds since start of 1993) |
| end_Latitude | 64-bit floating-point | None | Geodetic Latitude of spacecraft at end of granule in degrees North (-90.0 ... 90.0) |
| end_Longitude | 64-bit floating-point | None | Geodetic Longitude of spacecraft at end of granule in degrees East (-180.0 ... 180.0) |
| end_Time | 64-bit floating-point | None | TAI Time at end of granule (floating-point elapsed seconds since start of 1993) |
| eq_x_longitude | 32-bit floating-point | None | Longitude of spacecraft at southward equator crossing nearest granule start in degrees East (-180.0 ... 180.0) |
| eq_x_tai | 64-bit floating-point | None | Time of eq_x_longitude in TAI units (floating-point elapsed seconds since start of 1993) |
| orbitgeoqa | 32-bit unsigned integer | None | Orbit Geolocation QA: bit 0 (LSB): bad input value (last scanline); bit 1: bad input value (first scanline); bit 2: PGS_EPH_GetEphMet() returned PGSEPH_E_NO_SC_EPHEM_FILE; bit 3: PGS_EPH_GetEphMet() returned PGSEPH_E_BAD_ARRAY_SIZE; bit 4: PGS_EPH_GetEphMet() returned PGSTD_E_TIME_FMT_ERROR; bit 5: PGS_EPH_GetEphMet() returned PGSTD_E_TIME_VALUE_ERROR; bit 6: PGS_EPH_GetEphMet() returned PGSTD_E_SC_TAG_UNKNOWN; bit 7: PGS_EPH_GetEphMet() returned PGS_E_TOOLKIT; bit 8: PGS_TD_UTCToTAI() returned PGSTD_E_NO_LEAP_SECS; bit 9: PGS_TD_UTCToTAI() returned PGSTD_E_TIME_FMT_ERROR; bit 10: PGS_TD_UTCToTAI() returned PGSTD_E_TIME_VALUE_ERROR; bit 11: PGS_TD_UTCToTAI() returned PGS_E_TOOLKIT; bit 12: PGS_CSC_DayNight() returned PGSTD_E_NO_LEAP_SECS; bit 13: PGS_CSC_DayNight() returned PGSCSC_E_INVALID_LIMITTAG; bit 14: PGS_CSC_DayNight() returned PGSCSC_E_BAD_ARRAY_SIZE; bit 15: PGS_CSC_DayNight() returned PGSCSC_W_ERROR_IN_DAYNIGHT; bit 16: PGS_CSC_DayNight() returned PGSCSC_W_BAD_TRANSFORM_VALUE; bit 17: PGS_CSC_DayNight() returned PGSCSC_W_BELOW_HORIZON; bit 18: PGS_CSC_DayNight() returned PGSCSC_W_PREDICTED_UT1; bit 19: PGS_CSC_DayNight() returned PGSTD_E_NO_UT1_VALUE; bit 20: PGS_CSC_DayNight() returned PGSTD_E_BAD_INITIAL_TIME; bit 21: PGS_CSC_DayNight() returned PGSCBP_E_TIME_OUT_OF_RANGE; bit 22: PGS_CSC_DayNight() returned PGSCBP_E_UNABLE_TO_OPEN_FILE; bit 23: PGS_CSC_DayNight() returned PGSMEM_E_NO_MEMORY; bit 24: PGS_CSC_DayNight() returned PGS_E_TOOLKIT; bit 25-31: not used |

| | | | |
|-------------------|--|-----------------|--|
| num_satgeoqa | 16-bit integer | None | Number of scans with problems in satgeoqa |
| num_glintgeoqa | 16-bit integer | None | Number of scans with problems in glintgeoqa |
| num_moongoqa | 16-bit integer | None | Number of scans with problems in moongoqa |
| num_ftptgeoqa | 16-bit integer | None | Number of footprints with problems in ftptgeoqa |
| num_zengeoqa | 16-bit integer | None | Number of footprints with problems in zengeoqa |
| num_demgeoqa | 16-bit integer | None | Number of footprints with problems in demgeoqa |
| num_fpe | 16-bit integer | None | Number of floating point errors |
| LonGranuleCen | 16-bit integer | None | Geodetic Longitude of the center of the granule in degrees East (-180 ... 180) |
| LatGranuleCen | 16-bit integer | None | Geodetic Latitude of the center of the granule in degrees North (-90 ... 90) |
| LocTimeGranuleCen | 16-bit integer | None | Local solar time at the center of the granule in minutes past midnight (0 ... 1439) |
| apid_414_cnt | AIRS Engineering Packet Counts (see below) | None | Counts of packets of APID 414 (AIRS fixed high-rate engineering 1) by condition |
| apid_415_cnt | AIRS Engineering Packet Counts (see below) | None | Counts of packets of APID 415 (AIRS fixed high-rate engineering 2) by condition |
| apid_416_cnt | AIRS Engineering Packet Counts (see below) | None | Counts of packets of APID 416 (AIRS flexible high-rate engineering 1) by condition |
| apid_417_cnt | AIRS Engineering Packet Counts (see below) | None | Counts of packets of APID 417 (AIRS flexible high-rate engineering 2) by condition |
| apid_405_cnt | AIRS Science/Calibration Packet Counts (see below) | None | Counts of packets of APID 405 (AIRS Space) by condition |
| apid_406_cnt | AIRS Science/Calibration Packet Counts (see below) | None | Counts of packets of APID 406 (AIRS Blackbody) by condition |
| apid_407_cnt | AIRS Science/Calibration Packet Counts (see below) | None | Counts of packets of APID 407 (AIRS Spectral/Photometric) by condition |
| cal_reflector_dev | Unlimited Engineering Struct (see below) | GeoXTrack (= 6) | Statistics describing deviations of the viewing angle "scanang" from expected scan position for each calibration footprint position averaged over the scanlines in the granule (degrees) |
| HasPhotoCal | 32-bit integer | None | 1 if granule includes any scans with photometric calibration lamps on, 0 otherwise |

Size: 593 bytes (0.0 MB) per granule

Along-Track Data Fields

These fields appear once per scanline (GeoTrack times)

| Name | Type | Extra Dimensions | Explanation |
|-----------|-------------------------|------------------|---|
| satheight | 32-bit floating-point | None | Satellite altitude at nadirTAI in km above reference ellipsoid (e.g. 725.2) |
| satroll | 32-bit floating-point | None | Satellite attitude roll angle at nadirTAI (-180.0 ... 180.0 angle about the +x (roll) ORB axis. +x axis is positively oriented in the direction of orbital flight completing an orthogonal triad with y and z.) |
| satpitch | 32-bit floating-point | None | Satellite attitude pitch angle at nadirTAI (-180.0 ... 180.0 angle about +y (pitch) ORB axis. +y axis is oriented normal to the orbit plane with the positive sense opposite to that of the orbit's angular momentum vector H.) |
| satyaw | 32-bit floating-point | None | Satellite attitude yaw angle at nadirTAI (-180.0 ... 180.0 angle about +z (yaw) axis. +z axis is positively oriented earthward parallel to the satellite radius vector R from the spacecraft center of mass to the center of the Earth.) |
| satgeoqa | 32-bit unsigned integer | None | Satellite Geolocation QA flags: bit 0 (LSB): bad input value; bit 1: PGS_TD_TAItUTC() returned PGSTD_E_NO_LEAP_SECS; bit 2: PGS_TD_TAItUTC() returned PGS_E_TOOLKIT; bit 3: PGS_EPH_EphemAttit() returned PGSEPH_W_BAD_EPHEM_VALUE; bit 4: PGS_EPH_EphemAttit() returned PGSEPH_E_BAD_EPHEM_FILE_HDR; bit 5: PGS_EPH_EphemAttit() returned PGSEPH_E_NO_SC_EPHEM_FILE; bit 6: PGS_EPH_EphemAttit() returned PGSEPH_E_NO_DATA_REQUESTED; bit 7: PGS_EPH_EphemAttit() returned PGSTD_E_SC_TAG_UNKNOWN; bit 8: PGS_EPH_EphemAttit() returned PGSEPH_E_BAD_ARRAY_SIZE; bit 9: PGS_EPH_EphemAttit() returned PGSTD_E_TIME_FMT_ERROR; bit 10: PGS_EPH_EphemAttit() returned PGSTD_E_TIME_VALUE_ERROR; bit 11: PGS_EPH_EphemAttit() returned PGSTD_E_NO_LEAP_SECS; bit 12: PGS_EPH_EphemAttit() returned PGS_E_TOOLKIT; bit 13: PGS_CSC_ECItECR() returned PGSCSC_W_RAD_TRANSFORM_VALID; bit 14: PGS_CSC_ECItECR() returned |

| | | | |
|------------------|-------------------------|------|---|
| | | | PGSCSC_E_BAD_ARRAY_SIZE; bit 15: PGS_CSC_EClttoECR() returned PGSTD_E_NO_LEAP_SECS; bit 16: PGS_CSC_EClttoECR() returned PGSTD_E_TIME_FMT_ERROR; bit 17: PGS_CSC_EClttoECR() returned PGSTD_E_TIME_VALUE_ERROR; bit 18: unused (set to zero); bit 19: PGS_CSC_EClttoECR() returned PGSTD_E_NO_UT1_VALUE; bit 20: PGS_CSC_EClttoECR() returned PGS_E_TOOLKIT; bit 21: PGS_CSC_ECRtoGEO() returned PGSCSC_W_TOO_MANY_ITERS; bit 22: PGS_CSC_ECRtoGEO() returned PGSCSC_W_INVALID_ALTITUDE; bit 23: PGS_CSC_ECRtoGEO() returned PGSCSC_W_SPHERE_BODY; bit 24: PGS_CSC_ECRtoGEO() returned PGSCSC_W_LARGE_FLATTENING; bit 25: PGS_CSC_ECRtoGEO() returned PGSCSC_W_DEFAULT_EARTH_MODEL; bit 26: PGS_CSC_ECRtoGEO() returned PGSCSC_E_BAD_EARTH_MODEL; bit 27: PGS_CSC_ECRtoGEO() returned PGS_E_TOOLKIT; bit 28-31: not used |
| glintgeoqa | 16-bit unsigned integer | None | Glnt Geolocation QA flags: bit 0 (LSB): bad input value; bit 1: glint location in Earth's shadow; bit 2: glint calculation not converging; bit 3: glint location sun vs. satellite zenith mismatch; bit 4: glint location sun vs. satellite azimuth mismatch; bit 5: bad glint location; bit 6: PGS_CSC_ZenithAzimuth() returned any 'W' class return code; bit 7: PGS_CSC_ZenithAzimuth() returned any 'E' class return code; bit 8: PGS_CBP_Earth_CB_Vector() returned any 'W' class return code; bit 9: PGS_CBP_Earth_CB_Vector() returned any 'E' class return code; bit 10: PGS_CSC_EClttoECR() returned any 'W' class return code except PGSCSC_W_PREDICTED_UT1 (for Glint); bit 11: PGS_CSC_EClttoECR() returned any 'E' class return code (for Glint); bit 12: PGS_CSC_ECRtoGEO() returned any 'W' class return code (for Glint); bit 13: PGS_CSC_ECRtoGEO() returned any 'E' class return code (for Glint); bit 14: PGS_CSC_EClttoECR() returned any 'W' class return code except PGSCSC_W_PREDICTED_UT1; bit 15: PGS_CSC_EClttoECR() returned any 'E' class return code |
| moongeoa | 16-bit unsigned integer | None | Moon Geolocation QA flags: bit 0 (LSB): bad input value; bit 1: PGS_TD_TAltoUTC() returned PGSTD_E_NO_LEAP_SECS; bit 2: PGS_TD_TAltoUTC() returned PGS_E_TOOLKIT; bit 3: PGS_CBP_Sat_CB_Vector() returned PGSCSC_W_BELOW_SURFACE; bit 4: PGS_CBP_Sat_CB_Vector() returned PGSCBP_W_BAD_CB_VECTOR; bit 5: PGS_CBP_Sat_CB_Vector() returned PGSCBP_E_BAD_ARRAY_SIZE; bit 6: PGS_CBP_Sat_CB_Vector() returned PGSCBP_E_INVALID_CB_ID; bit 7: PGS_CBP_Sat_CB_Vector() returned PGSMEM_E_NO_MEMORY; bit 8: PGS_CBP_Sat_CB_Vector() returned PGSCBP_E_UNABLE_TO_OPEN_FILE; bit 9: PGS_CBP_Sat_CB_Vector() returned PGSTD_E_BAD_INITIAL_TIME; bit 10: PGS_CBP_Sat_CB_Vector() returned PGSCBP_E_TIME_OUT_OF_RANGE; bit 11: PGS_CBP_Sat_CB_Vector() returned PGSTD_E_SC_TAG_UNKNOWN; bit 12: PGS_CBP_Sat_CB_Vector() returned PGSEPH_E_BAD_EPHEM_FILE_HDR; bit 13: PGS_CBP_Sat_CB_Vector() returned PGSEPH_E_NO_SC_EPHEM_FILE; bit 14: PGS_CBP_Sat_CB_Vector() returned PGS_E_TOOLKIT; bit 15: not used |
| EngDataFormt1 | 16-bit unsigned integer | None | Data field format used for multiple alternate lists from HR Eng packet 1 (=13 for default (fixed format); see AIRS THB Table 4-2) |
| EngDataFormt2 | 16-bit unsigned integer | None | Data field format used for multiple alternate lists from HR Eng packet 2 (=13 for default (fixed format); see AIRS THB Table 4-2) |
| EdABIndic1 | 32-bit floating-point | None | EDC A/B Powered on Indicator (A=2.5 B=0) (Volts) |
| EdABIndic2 | 32-bit floating-point | None | EDC A/B Powered on Indicator (A=2.5 B=0) (Volts) |
| OpMode | 16-bit unsigned integer | None | Instrument Operations Mode. See AIRS Command Handbook, section 6.4 for a definition of each bit. bits 0 (LSB)-2 cal phase; bits 3-6 Cal Func; bit 7 quicklook (expedited) flag; bits 8-11 submode bits 12-14 Mode (0=standby, 1=ready, 2=operate, 3=checkout, 4=decontaminate, 5=off, 6=survival); bit 16 transition flag |
| ScOpModeCurr | 8-bit unsigned integer | None | Scanner Operating Mode - current mode. 0=Power Down; 1=Idle; 2=Find Index; 3=Scan; 4=Point; 5=Shut Down; 6=Idle/Index Found |
| ScOpModeCmdd | 8-bit unsigned integer | None | Scanner Operating Mode - commanded mode. 0=Power Down; 1=Idle; 2=Find Index; 3=Scan; 4=Point; 5=Shut Down; 6=Idle/Index Found |
| RTShrdMemFail | 8-bit unsigned integer | None | Flag indicating test of remote term mem failed - bit 15 (msb) of sw status wd 1 |
| MemoryFail | 8-bit unsigned integer | None | RAM failure detected by Perform Memory Test - bit 12 of software status word 1 |
| ROMChecksumError | 8-bit unsigned integer | None | ROM checksum error detected by Perform Memory Test - bit 11 of sw status word 1 |
| RTMessgeError | 8-bit unsigned integer | None | Summit chip reported remote terminal message error - bit 9 of sw status word 1 |
| MissingEDTC | 8-bit unsigned integer | None | End of Data Transfer Cycle msg not recvd in time - bit 8 of sw status word 1 |
| MissngTimSync | 8-bit unsigned integer | None | S/C time code or sync signals missing several times - bit 7 of sw status word 1 |
| VCXOConstrErr | 8-bit unsigned integer | None | VCXO Constr Error - bit 6 of software status word 1 |
| InsClkHldgOvw | 8-bit unsigned integer | None | Flag indicating inst clock holding reg overwritten - bit 5 of sw status word 1 |
| InstClkAdjust | 8-bit unsigned integer | None | Flag indicating inst clock adjusted to s/c time signal - bit 3 of sw status wd 1 |

| | | | |
|------------------|------------------------|-------------------|---|
| ResetCause | 8-bit unsigned integer | None | Cause of the latest software reset - bits 2 - 0 (LSBs) of software status word 1 |
| ICIProtFault | 8-bit unsigned integer | None | ICI Protection Fault - bit 14 of software status word 2 |
| ICInvalRange | 8-bit unsigned integer | None | ICI Invalid Range - bit 13 of software status word 2 |
| ICInvChannel | 8-bit unsigned integer | None | Flag indicating invalid port number in a serial cmd - bit 11 of sw status word 2 |
| RTBITFail | 8-bit unsigned integer | None | Flag indicating remote terminal BIT test failed - bit 10 of sw status word 2 |
| AmaRelayFaild | 8-bit unsigned integer | None | Flag indicating AMA actuator selection failed - bit 14 of software status word 3 |
| AmaStepFailed | 8-bit unsigned integer | None | Actuator failed to move requested number of steps - bit 13 of sw status word 3 |
| Ama3EndState | 8-bit unsigned integer | None | AMA end state for actuator #3 - bits 12 - 10 of software status word 3 |
| Ama2EndState | 8-bit unsigned integer | None | AMA end state for actuator #2 - bits 9 - 7 of software status word 3 |
| ScnrOpnFail | 8-bit unsigned integer | None | Flag indicating scanner failed to perform as expected - bit 5 of sw status wd 2 |
| Ama1EndState | 8-bit unsigned integer | None | AMA end state for actuator #1 - bits 6 - 4 of software status word 3 |
| AmaSwStatus | 8-bit unsigned integer | None | AMA software processing state - bits 3 - 1 of software status word 3 |
| ScannrAtPoint | 8-bit unsigned integer | None | Flag indicating scanner is pointing in cmded direction - bit 0 of sw status wd 3 |
| AmaInvSwState | 8-bit unsigned integer | None | Flag indicating AMA reached an illegal state - bit 15 (msb) of sw status word 3 |
| ChPhaseErr | 32-bit floating-point | None | Chopper Phase Error (deg) |
| spacecraft_state | 8-bit integer | None | Spacecraft state (0=LNCH; 1=STBY; 2=SCI; 3=SAFE; 4=SRVL; 5-7=UNDF) (set to -1 when not known) |
| moonang | 32-bit floating-point | SpaceXTrack (= 4) | Angle (degrees) between the center of the moon and the boresight |
| ViSnrArrTemp | 32-bit floating-point | None | Vis/NIR Sensor Array Temperature (Celcius) |
| ScHeadTemp1 | 32-bit floating-point | None | Scanner Head Housing Temperature 1 (active A or B) (Celcius) |
| ViPowerVolt | 32-bit floating-point | None | Vis/NIR Power Voltage (not redundant) (Volts) |
| PhoPowerVolt | 32-bit floating-point | None | Photo calibrator power voltage (not redundant) (volts) |
| PhotoCalOn | 32-bit floating-point | None | Photo calibrator power on (0.0 = off 3.75 = on) (not redundant) (volts) |
| PhoCalLamp1On | 32-bit floating-point | None | Photo calibrator lamp 1 on (0.0 = not 4.5 = sel) (not redundant) (volts) |
| PhoCalLamp2On | 32-bit floating-point | None | Photo calibrator lamp 2 on (0.0 = not 4.5 = sel) (not redundant) (volts) |
| PhoCalLamp3On | 32-bit floating-point | None | Photo calibrator lamp 3 on (0.0 = not 4.5 = sel) (not redundant) (volts) |

Size: 15660 bytes (0.0 MB) per 45-scanset granule

Full Swath Data Fields

These fields appear for every footprint of every scanline in the granule (GeoTrack * GeoXTrack times)

| Name | Type | Extra Dimensions | Explanation |
|-------------------|-------------------------|--|--|
| counts | 16-bit unsigned integer | Channel (= 4) * SubTrack (= 9) * SubXTrack (= 8) | Raw counts (data numbers) for each channel |
| state | 32-bit integer | None | Data state: 0:Process, 1:Special, 2:Erroneous, 3:Missing |
| cal_footprint_TAI | 64-bit floating-point | None | TAI time of calibration footprint (floating-point elapsed seconds since start of 1993) |
| cal_scanang | 32-bit floating-point | None | Scanning angle of AIRS instrument for this calibration footprint (-180.0 ... 180.0, negative at start of scan, 0 at nadir) |

Size: 479520 bytes (0.5 MB) per 45-scanset granule

Total File Size (plus storage for dimensions and other HDF-EOS overhead): 499013 bytes (0.5 MB) per 45-scanset granule = 119.8 MB per day

Special AIRS Types

Unlimited Engineering Struct: This type is used for engineering data fields for which there are NOT known "yellow" limits

| Field Name | Type | Explanation |
|------------|-----------------------|---|
| min | 32-bit floating-point | Minimum value field takes on in granule (not valid when num = 0) |
| max | 32-bit floating-point | Maximum value field takes on in granule (not valid when num = 0) |
| mean | 32-bit floating-point | Mean of values field takes on in granule (not valid when num = 0) |
| dev | 32-bit floating-point | Standard Deviation of values field takes on in granule (not valid when num = 0) |
| num | 32-bit integer | Count of occurrences of field in granule (not including those counted in num_bad) |
| num_bad | 32-bit integer | Count of occasions on which field takes on invalid flag value (-9999) in granule |
| max_track | 32-bit integer | GeoTrack index (counting from 1) where max was found |
| max_xtrack | 32-bit integer | GeoXTrack index (counting from 1) where max was found |
| min_track | 32-bit integer | GeoTrack index (counting from 1) where min was found |
| min_xtrack | 32-bit integer | GeoXTrack index (counting from 1) where min was found |

AIRS Engineering Packet Counts: This type tracks counts of packets received during an interval by conditions under which they were received

| Field Name | Type | Explanation |
|--------------|----------------|---|
| missing_in | 16-bit integer | Count of packets missing between packets that are present |
| missing_ends | 16-bit integer | Count of packets missing at beginning or end of granule timespan: missing packets for which there are either no existing packets before them or no existing packets after them. (When all data is missing all packets will be counted here) |
| checksum_err | 16-bit integer | Count of packets with an error detected in the checksum |
| good | 16-bit integer | Count of packets not counted in any other category |

AIRS Science/Calibration Packet Counts: This type tracks counts of packets received during an interval by conditions under which they were received

| Field Name | Type | Explanation |
|--------------|----------------|---|
| missing_in | 16-bit integer | Count of packets missing between packets of any AIRS APID that are present |
| missing_ends | 16-bit integer | Count of packets missing at beginning or end of granule timespan: missing packets for which there are either no existing packets before them or no existing packets after them. (When all data is missing all packets will be counted here) |
| at_noop | 16-bit integer | Count of packets for which the spacecraft mode is not operational for some or all of the packet interval |
| illegal_mode | 16-bit integer | Count of packets for which there was an illegal instrument mode |
| special_cal | 16-bit integer | Count of packets for which the instrument was in a special calibration mode |
| invalid_data | 16-bit integer | Count of invalid packets (includes missing engineering) |
| checksum_err | 16-bit integer | Count of packets with an error detected in the checksum |
| good | 16-bit integer | Count of packets not counted in any other category |

A1-6. L1A AMSU-A Interface Specification

Interface Specification Version 3.0.4.0
2003-05-19

ESDT ShortName = "AIRAASI"

Swath Name = "L1A_AMSU"

Level = "level1A"

Footprints = 30

scanlines per scanset = 1

Dimensions

These fields define all dimensions that can be used for HDF-EOS swath fields.

The names "GeoTrack" and "GeoXTrack" have a special meaning for this document: "Cross-Track" data fields have a hidden dimension of "GeoXTrack"; "Along-Track" data fields have a hidden dimension of "GeoTrack"; "Full Swath Data Fields have hidden dimensions of both "GeoTrack" and "GeoXTrack".

| Name | Value | Explanation |
|--------------------|--------------------------|--|
| GeoXTrack | 30 | Dimension across track for footprint positions. Same as number of footprints per scanline. -- starting at the left and increasing towards the right as you look along the satellite's path |
| GeoTrack | # of scan lines in swath | Dimension along track for footprint positions. Same as number of scanlines in granule. Parallel to the satellite's path, increasing with time. (Nominally 45 for Level-2, AMSU-A, and AIRS/Vis low-rate engineering; 135 for AIRS/Vis and HSB high-rate quantities) |
| Channel | 15 | Dimension of channel array (Channel 1: 23.8 GHz; Ch 2: 31.4 GHz; Ch 3: 50.3 GHz; Ch 4: 52.8 GHz; Ch 5: 53.596 +/- 0.115 GHz; Ch 6: 54.4 GHz; Ch 7: 54.94 GHz; Ch 8: 55.5 GHz; Ch 9: f0; Ch 10: f0 +/- 0.217 GHz Ch 11: f0 +/- df +/- 48 MHz; Ch 12: f0 +/- df +/- 22 MHz; Ch 13: f0 +/- df +/- 10 MHz; Ch 14: f0 +/- df +/- 4.5 MHz; Ch 15: 89 GHz (f0 = 57290.344 MHz; df = 322.4 MHz)) |
| CalXTrack | 4 | Dimension "across" track for calibration footprint positions. Same as number of calibration footprints per scanline. (NUM_FOOTPRINTS_AMSU_CALIB) (Footprints are ordered: 1-2: spaceviews; 3-4: blackbody radiometric calibration source) |
| SpaceXTrack | 2 | Dimension "across" track for spaceview calibration footprint positions in order of observation time. (NUM_FOOTPRINTS_AMSU_SPACE) |
| BBXTrack | 2 | Dimension "across" track for blackbody calibration footprint positions in order of observation time. (NUM_FOOTPRINTS_AMSU_BB) |
| AnglesPerFootprint | 2 | Number of measurements of antenna pointing angle made for each AMSU-A footprint. First is before radiance measurement, second near the center of the measurement. |

Geolocation Fields

These fields appear for every footprint (GeoTrack * GeoXTrack times) and correspond to footprint center coordinates and "shutter" time.

| Name | Explanation |
|-----------|--|
| Latitude | Footprint boresight geodetic Latitude in degrees North (-90.0 ... 90.0) |
| Longitude | Footprint boresight geodetic Longitude in degrees East (-180.0 ... 180.0) |
| Time | Footprint "shutter" TAI Time: floating-point elapsed seconds since Jan 1, 1993 |

Size: 32400 bytes (0.0 MB) per 45-scanset granule

Attributes

These fields appear only once per granule

| Name | Type | Extra Dimensions | Explanation |
|------------------|----------------------------|------------------|---|
| processing_level | string of 8-bit characters | None | Zero-terminated character string denoting processing level ("level1A") |
| instrument | string of 8-bit characters | None | Zero-terminated character string denoting instrument ("AMSU-A") |
| DayNightFlag | string of 8-bit characters | None | Zero-terminated character string denoting granule as day and/or night: (Always "Day", "Night", or "Both") |
| AutomaticQAFlag | string of 8-bit characters | None | Zero-terminated character string denoting granule data quality: (Always "Passed", "Failed", or "Suspect") |
| NumTotalData | 32-bit integer | None | Total number of expected AMSU Packets |

| | | | |
|-----------------|----------------------------|------|---|
| NumProcessData | 32-bit integer | None | Number of AMSU Packets which are present and can be processed routinely (state = 0) |
| NumSpecialData | 32-bit integer | None | Number of AMSU Packets which are present and can be processed only as a special test (state = 1) |
| NumBadData | 32-bit integer | None | Number of AMSU Packets which are present but cannot be processed (state = 2) |
| NumMissingData | 32-bit integer | None | Number of expected AMSU Packets which are not present (state = 3) |
| NumLandSurface | 32-bit integer | None | Number of scene footprints for which the surface is more than 90% land |
| NumOceanSurface | 32-bit integer | None | Number of scene footprints for which the surface is less than 10% land |
| node_type | string of 8-bit characters | None | Zero-terminated character string denoting whether granule is ascending, descending, or pole-crossing: ("Ascending" and "Descending" for entirely ascending or entirely descending granules, or "NorthPole" or "SouthPole" for pole-crossing granules) |
| start_year | 32-bit integer | None | Year in which granule started, UTC (e.g. 1999) |
| start_month | 32-bit integer | None | Month in which granule started, UTC (1 ... 12) |
| start_day | 32-bit integer | None | Day of month in which granule started, UTC (1 ... 31) |
| start_hour | 32-bit integer | None | Hour of day in which granule started, UTC (0 ... 23) |
| start_minute | 32-bit integer | None | Minute of hour in which granule started, UTC (0 ... 59) |
| start_sec | 32-bit floating-point | None | Second of minute in which granule started, UTC (0.0 ... 59.0) |
| start_orbit | 32-bit integer | None | Orbit number of mission in which granule started |
| end_orbit | 32-bit integer | None | Orbit number of mission in which granule ended |
| orbit_path | 32-bit integer | None | Orbit path of start orbit (1 ... 233 as defined by EOS project) |
| start_orbit_row | 32-bit integer | None | Orbit row at start of granule (1 ... 248 as defined by EOS project) |
| end_orbit_row | 32-bit integer | None | Orbit row at end of granule (1 ... 248 as defined by EOS project) |
| granule_number | 32-bit integer | None | Number of granule within day (1 ... 240) |
| num_scansets | 32-bit integer | None | Number of scansets in granule (1 ... 45) |
| num_scanlines | 32-bit integer | None | Number of scanlines in granule (1 * num_scansets) |
| start_Latitude | 64-bit floating-point | None | Geodetic Latitude of spacecraft at start of granule in degrees North (-90.0 ... 90.0) |
| start_Longitude | 64-bit floating-point | None | Geodetic Longitude of spacecraft at start of granule in degrees East (-180.0 ... 180.0) |
| start_Time | 64-bit floating-point | None | TAI Time at start of granule (floating-point elapsed seconds since start of 1993) |
| end_Latitude | 64-bit floating-point | None | Geodetic Latitude of spacecraft at end of granule in degrees North (-90.0 ... 90.0) |
| end_Longitude | 64-bit floating-point | None | Geodetic Longitude of spacecraft at end of granule in degrees East (-180.0 ... 180.0) |
| end_Time | 64-bit floating-point | None | TAI Time at end of granule (floating-point elapsed seconds since start of 1993) |
| eq_x_longitude | 32-bit floating-point | None | Longitude of spacecraft at southward equator crossing nearest granule start in degrees East (-180.0 ... 180.0) |
| eq_x_tai | 64-bit floating-point | None | Time of eq_x_longitude in TAI units (floating-point elapsed seconds since start of 1993) |
| orbitgeoqa | 32-bit unsigned integer | None | Orbit Geolocation QA: bit 0 (LSB): bad input value (last scanline); bit 1: bad input value (first scanline); bit 2: PGS_EPH_GetEphMet() returned PGSEPH_E_NO_SC_EPHEM_FILE; bit 3: PGS_EPH_GetEphMet() returned PGSEPH_E_BAD_ARRAY_SIZE; bit 4: PGS_EPH_GetEphMet() returned PGSTD_E_TIME_FMT_ERROR; bit 5: PGS_EPH_GetEphMet() returned PGSTD_E_TIME_VALUE_ERROR; bit 6: PGS_EPH_GetEphMet() returned PGSTD_E_SC_TAG_UNKNOWN; bit 7: PGS_EPH_GetEphMet() returned PGS_E_TOOLKIT; bit 8: PGS_TD_UTCtoTAI() returned PGSTD_E_NO_LEAP_SECS; bit 9: PGS_TD_UTCtoTAI() returned PGSTD_E_TIME_FMT_ERROR; bit 10: PGS_TD_UTCtoTAI() returned PGSTD_E_TIME_VALUE_ERROR; bit 11: PGS_TD_UTCtoTAI() returned PGS_E_TOOLKIT; bit 12: PGS_CSC_DayNight() returned PGSTD_E_NO_LEAP_SECS; bit 13: PGS_CSC_DayNight() returned PGSCSC_E_INVALID_LIMITTAG; bit 14: PGS_CSC_DayNight() returned PGSCSC_E_BAD_ARRAY_SIZE; bit 15: PGS_CSC_DayNight() returned PGSCSC_W_ERROR_IN_DAYNIGHT; bit 16: PGS_CSC_DayNight() returned PGSCSC_W_BAD_TRANSFORM_VALUE; bit 17: PGS_CSC_DayNight() returned PGSCSC_W_BELOW_HORIZON; bit 18: PGS_CSC_DayNight() returned PGSCSC_W_PREDICTED_UT1; bit 19: PGS_CSC_DayNight() returned PGSTD_E_NO_UT1_VALUE; bit 20: PGS_CSC_DayNight() returned PGSTD_E_BAD_INITIAL_TIME; bit 21: PGS_CSC_DayNight() returned PGSCBP_E_TIME_OUT_OF_RANGE; bit 22: PGS_CSC_DayNight() returned PGSCBP_E_UNABLE_TO_OPEN_FILE; bit 23: PGS_CSC_DayNight() returned PGSMEM_E_NO_MEMORY; bit 24: PGS_CSC_DayNight() returned PGS_E_TOOLKIT; bit 25-31: not used |
| num_satgeoqa | 16-bit integer | None | Number of scans with problems in satgeoqa |

| | | | |
|-------------------|--------------------------------|------|--|
| num_glintgeoqa | 16-bit integer | None | Number of scans with problems in glintgeoqa |
| num_moongeoqa | 16-bit integer | None | Number of scans with problems in moongeoqa |
| num_ftptgeoqa | 16-bit integer | None | Number of footprints with problems in ftptgeoqa |
| num_zengeoqa | 16-bit integer | None | Number of footprints with problems in zengeoqa |
| num_demgeoqa | 16-bit integer | None | Number of footprints with problems in demgeoqa |
| num_fpe | 16-bit integer | None | Number of floating point errors |
| LonGranuleCen | 16-bit integer | None | Geodetic Longitude of the center of the granule in degrees East (-180 ... 180) |
| LatGranuleCen | 16-bit integer | None | Geodetic Latitude of the center of the granule in degrees North (-90 ... 90) |
| LocTimeGranuleCen | 16-bit integer | None | Local solar time at the center of the granule in minutes past midnight (0 ... 1439) |
| amsu_a1_sci_cnt | AMSU Packet Counts (see below) | None | Counts of AMSU-A1 science packets APIDs 257 (No Mode Science), 259 (Staring 1 Science), 260 (Staring 2 Science), 261 (Full Scan 1 Science), & 262 (Full Scan 2 Science) by condition (261 & 262 are counted together as a single packet) (AMSU-A1 is AMSU-A channels 3-15) |
| amsu_a2_sci_cnt | AMSU Packet Counts (see below) | None | Counts of AMSU-A2 science packets APIDs 288 (No Mode Science), 289 (Staring Science) & 290 (Full Scan Science) by condition (AMSU-A2 is AMSU-A channels 1 & 2) |

Size: 209 bytes (0.0 MB) per granule

Along-Track Data Fields

These fields appear once per scanline (GeoTrack times)

| Name | Type | Extra Dimensions | Explanation |
|------------|--|------------------|--|
| angdev_a11 | Unlimited Engineering Struct (see below) | None | Statistics on antenna misalignment for AMSU-A1-1 (AMSU-A1-1 is AMSU-A channels 6, 7, 9-15) (degrees) |
| angdev_a12 | Unlimited Engineering Struct (see below) | None | Statistics on antenna misalignment for AMSU-A1-2 (AMSU-A1-2 is AMSU-A channels 3, 4, 5, and 8) (degrees) |
| angdev_a2 | Unlimited Engineering Struct (see below) | None | Statistics on antenna misalignment for AMSU-A2 (AMSU-A2 is AMSU-A channels 1 & 2) (degrees) |
| satheight | 32-bit floating-point | None | Satellite altitude at nadirTAI in km above reference ellipsoid (e.g. 725.2) |
| satroll | 32-bit floating-point | None | Satellite attitude roll angle at nadirTAI (-180.0 ... 180.0 angle about the +x (roll) ORB axis, +x axis is positively oriented in the direction of orbital flight completing an orthogonal triad with y and z.) |
| satpitch | 32-bit floating-point | None | Satellite attitude pitch angle at nadirTAI (-180.0 ... 180.0 angle about +y (pitch) ORB axis, +y axis is oriented normal to the orbit plane with the positive sense opposite to that of the orbit's angular momentum vector H.) |
| satyaw | 32-bit floating-point | None | Satellite attitude yaw angle at nadirTAI (-180.0 ... 180.0 angle about +z (yaw) axis, +z axis is positively oriented earthward parallel to the satellite radius vector R from the spacecraft center of mass to the center of the Earth.) |
| satgeoqa | 32-bit unsigned integer | None | Satellite Geolocation QA flags: bit 0 (LSB): bad input value; bit 1: PGS_TD_TAtoUTC() returned PGSTD_E_NO_LEAP_SECS; bit 2: PGS_TD_TAtoUTC() returned PGS_E_TOOLKIT; bit 3: PGS_EPH_EphemAttit() returned PGSEPH_W_BAD_EPHEM_VALUE; bit 4: PGS_EPH_EphemAttit() returned PGSEPH_E_BAD_EPHEM_FILE_HDR; bit 5: PGS_EPH_EphemAttit() returned PGSEPH_E_NO_SC_EPHEM_FILE; bit 6: PGS_EPH_EphemAttit() returned PGSEPH_E_NO_DATA_REQUESTED; bit 7: PGS_EPH_EphemAttit() returned PGSTD_E_SC_TAG_UNKNOWN; bit 8: PGS_EPH_EphemAttit() returned PGSEPH_E_BAD_ARRAY_SIZE; bit 9: PGS_EPH_EphemAttit() returned PGSTD_E_TIME_FMT_ERROR; bit 10: PGS_EPH_EphemAttit() returned PGSTD_E_TIME_VALUE_ERROR; bit 11: PGS_EPH_EphemAttit() returned PGSTD_E_NO_LEAP_SECS; bit 12: PGS_EPH_EphemAttit() returned PGS_E_TOOLKIT; bit 13: PGS_CSC_ECtoECR() returned PGSCSC_W_BAD_TRANSFORM_VALUE; bit 14: PGS_CSC_ECtoECR() returned PGSCSC_E_BAD_ARRAY_SIZE; bit 15: PGS_CSC_ECtoECR() returned PGSTD_E_NO_LEAP_SECS; bit 16: PGS_CSC_ECtoECR() returned PGSTD_E_TIME_FMT_ERROR; bit 17: PGS_CSC_ECtoECR() returned PGSTD_E_TIME_VALUE_ERROR; bit 18: unused (set to zero); bit 19: PGS_CSC_ECtoECR() returned PGSTD_E_NO_UT1_VALUE; bit 20: PGS_CSC_ECtoECR() returned PGS_E_TOOLKIT; bit 21: PGS_CSC_ECRtoGEO() returned PGSCSC_W_TOO_MANY_ITERS; bit 22: PGS_CSC_ECRtoGEO() returned PGSCSC_W_INVALID_ALTITUDE; bit 23: PGS_CSC_ECRtoGEO() returned PGSCSC_W_SPHERE_BODY; bit 24: PGS_CSC_ECRtoGEO() returned PGSCSC_W_LARGE_FLATTENING; bit 25: PGS_CSC_ECRtoGEO() returned PGSCSC_W_DIFFAII T EARTH MODFI · bit 26: |

| | | | |
|-------------------|-------------------------|--------------------------|--|
| | | | PGS_CSC_ECRtoGEO() returned PGSCSC_E_BAD_EARTH_MODEL; bit 27: PGS_CSC_ECRtoGEO() returned PGS_E_TOOLKIT; bit 28-31: not used |
| glintgeoqa | 16-bit unsigned integer | None | Glint Geolocation QA flags: bit 0 (LSB): bad input value; bit 1: glint location in Earth's shadow; bit 2: glint calculation not converging; bit 3: glint location sun vs. satellite zenith mismatch; bit 4: glint location sun vs. satellite azimuth mismatch; bit 5: bad glint location; bit 6: PGS_CSC_ZenithAzimuth() returned any 'W' class return code; bit 7: PGS_CSC_ZenithAzimuth() returned any 'E' class return code; bit 8: PGS_CBP_Earth_CB_Vector() returned returned any 'W' class return code; bit 9: PGS_CBP_Earth_CB_Vector() returned returned any 'E' class return code; bit 10: PGS_CSC_ECtoECR() returned any 'W' class return code except PGSCSC_W_PREDICTED_UT1 (for Glint); bit 11: PGS_CSC_ECtoECR() returned any 'E' class return code (for Glint); bit 12: PGS_CSC_ECRtoGEO() returned any 'W' class return code (for Glint); bit 13: PGS_CSC_ECRtoGEO() returned any 'E' class return code (for Glint); bit 14: PGS_CSC_ECtoECR() returned any 'W' class return code except PGSCSC_W_PREDICTED_UT1; bit 15: PGS_CSC_ECtoECR() returned any 'E' class return code |
| moongeoqa | 16-bit unsigned integer | None | Moon Geolocation QA flags: bit 0 (LSB): bad input value; bit 1: PGS_TD_TAltoUTC() returned PGSTD_E_NO_LEAP_SECS; bit 2: PGS_TD_TAltoUTC() returned PGS_E_TOOLKIT; bit 3: PGS_CBP_Sat_CB_Vector() returned PGSCSC_W_BELOW_SURFACE; bit 4: PGS_CBP_Sat_CB_Vector() returned PGSCBP_W_BAD_CB_VECTOR; bit 5: PGS_CBP_Sat_CB_Vector() returned PGSCBP_E_BAD_ARRAY_SIZE; bit 6: PGS_CBP_Sat_CB_Vector() returned PGSCBP_E_INVALID_CB_ID; bit 7: PGS_CBP_Sat_CB_Vector() returned PGSMEM_E_NO_MEMORY; bit 8: PGS_CBP_Sat_CB_Vector() returned PGSCBP_E_UNABLE_TO_OPEN_FILE; bit 9: PGS_CBP_Sat_CB_Vector() returned PGSTD_E_BAD_INITIAL_TIME; bit 10: PGS_CBP_Sat_CB_Vector() returned PGSCBP_E_TIME_OUT_OF_RANGE; bit 11: PGS_CBP_Sat_CB_Vector() returned PGSTD_E_SC_TAG_UNKNOWN; bit 12: PGS_CBP_Sat_CB_Vector() returned PGSEPH_E_BAD_EPHEM_FILE_HDR; bit 13: PGS_CBP_Sat_CB_Vector() returned PGSEPH_E_NO_SC_EPHEM_FILE; bit 14: PGS_CBP_Sat_CB_Vector() returned PGS_E_TOOLKIT; bit 15: not used |
| nadirTAI | 64-bit floating-point | None | TAI time at which instrument is nominally looking directly down. (between footprints 15 & 16 for AMSU or between footprints 45 & 46 for AIRS/Vis & HSB) (floating-point elapsed seconds since start of 1993) |
| sat_lat | 64-bit floating-point | None | Satellite geodetic latitude in degrees North (-90.0 ... 90.0) |
| sat_lon | 64-bit floating-point | None | Satellite geodetic longitude in degrees East (-180.0 ... 180.0) |
| scan_node_type | 8-bit integer | None | 'A' for ascending, 'D' for descending, 'N' for North-Polar, 'S' for South-Polar |
| glintlat | 32-bit floating-point | None | Solar glint geodetic latitude in degrees North at nadirTAI (-90.0 ... 90.0) |
| glintlon | 32-bit floating-point | None | Solar glint geodetic longitude in degrees East at nadirTAI (-180.0 ... 180.0) |
| space_scanang_a11 | 32-bit floating-point | AnglesPerFootprint (= 2) | Scanning angles (before & after) of AMSU-A1-1 antenna for the spaceview footprints (AMSU-A1-1 is AMSU-A channels 6, 7, 9-15) (-180.0 ... 180.0) |
| space_scanang_a12 | 32-bit floating-point | AnglesPerFootprint (= 2) | Scanning angles (before & after) of AMSU-A1-2 antenna for the spaceview footprints (AMSU-A1-2 is AMSU-A channels 3, 4, 5, and 8) (-180.0 ... 180.0) |
| space_scanang_a2 | 32-bit floating-point | AnglesPerFootprint (= 2) | Scanning angles (before & after) of AMSU-A2 antenna for the spaceview footprints (AMSU-A2 is AMSU-A channels 1 & 2) (-180.0 ... 180.0) |
| bb_scanang_a11 | 32-bit floating-point | AnglesPerFootprint (= 2) | Scanning angles (before & after) of AMSU-A1-1 antenna for the warm calibration target footprints (AMSU-A1-1 is AMSU-A channels 6, 7, 9-15) (-180.0 ... 180.0) |
| bb_scanang_a12 | 32-bit floating-point | AnglesPerFootprint (= 2) | Scanning angles (before & after) of AMSU-A1-2 antenna for the warm calibration target footprints (AMSU-A1-2 is AMSU-A channels 3, 4, 5, and 8) (-180.0 ... 180.0) |
| bb_scanang_a2 | 32-bit floating-point | AnglesPerFootprint (= 2) | Scanning angles (before & after) of AMSU-A2 antenna for the spaceview footprints (AMSU-A2 is AMSU-A channels 1 & 2) (-180.0 ... 180.0) |
| moonang_a11 | 32-bit floating-point | None | Angle (degrees) between the center of the moon and the boresight of AMSU-A1-1 (AMSU-A1-1 is AMSU-A channels 6, 7, 9-15) |
| moonang_a12 | 32-bit floating-point | None | Angle (degrees) between the center of the moon and the boresight of AMSU-A1-2 (AMSU-A1-2 is AMSU-A channels 3, 4, 5, and 8) |
| moonang_a2 | 32-bit floating-point | None | Angle (degrees) between the center of the moon and the boresight of AMSU-A2 (AMSU-A2 is AMSU-A channels 1 & 2) |
| state1 | 32-bit integer | None | AMSU-A1 Data state: 0:Process, 1:Special, 2:Erroneous, 3:Missing (AMSU-A1 is AMSU-A channels 3-15) |
| state2 | 32-bit integer | None | AMSU-A2 Data state: 0:Process, 1:Special, 2:Erroneous, 3:Missing (AMSU-A2 is AMSU-A channels 1 & 2) |
| spacecraft_state | 8-bit integer | None | Spacecraft state (0=I NCH· 1=STRY· 2=SCI· 3=SAFF· 4=SRVI· 5-7=I INDF) |

| | | | |
|---------------------------|-----------------------|------|--|
| | | | (set to -1 when not known) |
| spacecraft_xmtr_a_on | 8-bit integer | None | Spacecraft Transmitter A On/Off status (0=Off; 1=On; -1=Unknown) |
| spacecraft_xmtr_b_on | 8-bit integer | None | Spacecraft Transmitter B On/Off status (0=Off; 1=On; -1=Unknown) |
| spacecraft_modulator_a_on | 8-bit integer | None | Spacecraft Modulator A On/Off status (0=Off; 1=On; -1=Unknown) |
| spacecraft_modulator_b_on | 8-bit integer | None | Spacecraft Modulator B On/Off status (0=Off; 1=On; -1=Unknown) |
| spacecraft_xmtr_a_pwr | 32-bit floating-point | None | Spacecraft Transmitter A Power (DBW; -1=Unknown) |
| spacecraft_xmtr_b_pwr | 32-bit floating-point | None | Spacecraft Transmitter B Power (DBW; -1=Unknown) |
| a1_Ant_Full_Scan | 8-bit integer | None | AMSU-A1 Antenna in FullScan Mode |
| a1_Ant_Warm_Cal | 8-bit integer | None | AMSU-A1 Antenna in Warm Calibration Mode |
| a1_Ant_Cold_Cal | 8-bit integer | None | AMSU-A1 Antenna in Cold Calibration Mode |
| a1_Ant_Nadir | 8-bit integer | None | AMSU-A1 Antenna in Nadir Mode |
| a1_ColdCalPstion | 8-bit integer | None | AMSU-A1 Cold Calibration Position 1-4 (Binary 0-3) |
| a1_ResetProcessr | 8-bit integer | None | AMSU-A1 Reset C&DH Processor (command) |
| a1_PLO_Redundncy | 8-bit integer | None | AMSU-A1 PLO Redundancy, PLL0 1 ON or PLL0 2 ON |
| a1_ScannerPwr_1 | 8-bit integer | None | AMSU-A1 Scanner Power 1, ON/Off |
| a1_ScannerPwr_2 | 8-bit integer | None | AMSU-A1 Scanner Power 2, ON/Off |
| a1_PLO_1_Lock_St | 8-bit integer | None | AMSU-A1 PLO #1 Lock Status |
| a1_PLO_2_Lock_St | 8-bit integer | None | AMSU-A1 PLO #2 Lock Status |
| a1_ADC_LatchupFl | 8-bit integer | None | AMSU-A1 ADC Latchup Flag (Status) |
| a11_scan_motor_temp | 32-bit floating-point | None | AMSU-A1-1 Scan Motor Temperature (Celcius) |
| a12_scan_motor_temp | 32-bit floating-point | None | AMSU-A1-2 Scan Motor Temperature (Celcius) |
| a11_feedhorn_temp | 32-bit floating-point | None | AMSU-A1-1 Feedhorn Temperature (Celcius) |
| a12_feedhorn_temp | 32-bit floating-point | None | AMSU-A1-2 Feedhorn Temperature (Celcius) |
| a11_rf_mux_temp | 32-bit floating-point | None | AMSU-A1-1 RF Mux Temperature (Celcius) |
| a12_rf_mux_temp | 32-bit floating-point | None | AMSU-A1-2 RF Mux Temperature (Celcius) |
| a1_lo_ch3_temp | 32-bit floating-point | None | AMSU-A1 Local Oscillator Channel 3 Temperature (Celcius) |
| a1_lo_ch4_temp | 32-bit floating-point | None | AMSU-A1 Local Oscillator Channel 4 Temperature (Celcius) |
| a1_lo_ch5_temp | 32-bit floating-point | None | AMSU-A1 Local Oscillator Channel 5 Temperature (Celcius) |
| a1_lo_ch6_temp | 32-bit floating-point | None | AMSU-A1 Local Oscillator Channel 6 Temperature (Celcius) |
| a1_lo_ch7_temp | 32-bit floating-point | None | AMSU-A1 Local Oscillator Channel 7 Temperature (Celcius) |
| a1_lo_ch8_temp | 32-bit floating-point | None | AMSU-A1 Local Oscillator Channel 8 Temperature (Celcius) |
| a1_lo_ch15_temp | 32-bit floating-point | None | AMSU-A1 Local Oscillator Channel 15 Temperature (Celcius) |
| a1_plo2_temp | 32-bit floating-point | None | AMSU-A1 Phase Locked Oscillator 2 Temperature (Celcius) |
| a1_plo1_temp | 32-bit floating-point | None | AMSU-A1 Phase Locked Oscillator 1 Temperature (Celcius) |
| a1_sp_1553_if_temp | 32-bit floating-point | None | AMSU-A1 S.P. (1553 I/F) Temperature (Celcius) |
| a1_mxr_if_amp_ch3_temp | 32-bit floating-point | None | AMSU-A1 Mixer/IF Amp/Channel 3 Temperature (Celcius) |
| a1_mxr_if_amp_ch4_temp | 32-bit floating-point | None | AMSU-A1 Mixer/IF Amp/Channel 4 Temperature (Celcius) |
| a1_mxr_if_amp_ch5_temp | 32-bit floating-point | None | AMSU-A1 Mixer/IF Amp/Channel 5 Temperature (Celcius) |

| | | | |
|---------------------------|-----------------------|------|---|
| a1_mxr_if_amp_ch6_temp | 32-bit floating-point | None | AMSU-A1 Mixer/IF Amp/Channel 6 Temperature (Celcius) |
| a1_mxr_if_amp_ch7_temp | 32-bit floating-point | None | AMSU-A1 Mixer/IF Amp/Channel 7 Temperature (Celcius) |
| a1_mxr_if_amp_ch8_temp | 32-bit floating-point | None | AMSU-A1 Mixer/IF Amp/Channel 8 Temperature (Celcius) |
| a1_mxr_if_amp_ch9_14_temp | 32-bit floating-point | None | AMSU-A1 Mixer/IF Amp/Channel 9/14 Temperature (Celcius) |
| a1_mxr_if_amp_ch15_temp | 32-bit floating-point | None | AMSU-A1 Mixer/IF Amp/Channel 15 Temperature (Celcius) |
| a1_if_amp_ch11_14_temp | 32-bit floating-point | None | AMSU-A1 IF Amp Channel 11/14 Temperature (Celcius) |
| a1_if_amp_ch9_temp | 32-bit floating-point | None | AMSU-A1 IF Amp Channel 9 Temperature (Celcius) |
| a1_if_amp_ch10_temp | 32-bit floating-point | None | AMSU-A1 IF Amp Channel 10 Temperature (Celcius) |
| a1_if_amp_ch11_temp | 32-bit floating-point | None | AMSU-A1 IF Amp Channel 11 Temperature (Celcius) |
| a1_if_amp_ch12_temp | 32-bit floating-point | None | AMSU-A1 IF Amp Channel 12 Temperature (Celcius) |
| a1_if_amp_ch13_temp | 32-bit floating-point | None | AMSU-A1 IF Amp Channel 13 Temperature (Celcius) |
| a1_if_amp_ch14_temp | 32-bit floating-point | None | AMSU-A1 IF Amp Channel 14 Temperature (Celcius) |
| a1_dc_dc_conv_temp | 32-bit floating-point | None | AMSU-A1 DC/DC Converter Temperature (Celcius) |
| a11_rf_shelf_temp | 32-bit floating-point | None | AMSU-A1-1 RF Shelf Temperature (Celcius) |
| a12_rf_shelf_temp | 32-bit floating-point | None | AMSU-A1-2 RF Shelf Temperature (Celcius) |
| a1_det_preamp_temp | 32-bit floating-point | None | AMSU-A1 Detector/PreAmp Temperature (Celcius) |
| a11_warm_load_1_temp | 32-bit floating-point | None | AMSU-A1-1 Warm Load 1 Temperature (Celcius) |
| a11_warm_load_2_temp | 32-bit floating-point | None | AMSU-A1-1 Warm Load 2 Temperature (Celcius) |
| a11_warm_load_3_temp | 32-bit floating-point | None | AMSU-A1-1 Warm Load 3 Temperature (Celcius) |
| a11_warm_load_4_temp | 32-bit floating-point | None | AMSU-A1-1 Warm Load 4 Temperature (Celcius) |
| a11_warm_load_c_temp | 32-bit floating-point | None | AMSU-A1-1 Warm Load Center Temperature (Celcius) |
| a12_warm_load_1_temp | 32-bit floating-point | None | AMSU-A1-2 Warm Load 1 Temperature (Celcius) |
| a12_warm_load_2_temp | 32-bit floating-point | None | AMSU-A1-2 Warm Load 2 Temperature (Celcius) |
| a12_warm_load_3_temp | 32-bit floating-point | None | AMSU-A1-2 Warm Load 3 Temperature (Celcius) |
| a12_warm_load_4_temp | 32-bit floating-point | None | AMSU-A1-2 Warm Load 4 Temperature (Celcius) |
| a12_warm_load_c_temp | 32-bit floating-point | None | AMSU-A1-2 Warm Load Center Temperature (Celcius) |
| a1_prt_ref_v | 32-bit floating-point | None | AMSU-A1 PRT Reference Voltage (Counts) |
| a1_sp_p5_v | 32-bit floating-point | None | AMSU-A1 Signal Processor +5 Volts (Volts DC) |
| a1_sp_p15_v | 32-bit floating-point | None | AMSU-A1 Signal Processor +15 Volts (Volts DC) |
| a1_sp_m15_v | 32-bit floating-point | None | AMSU-A1 Signal Processor -15 Volts (Volts DC) |
| a1_sd_p5_v | 32-bit floating-point | None | AMSU-A1 Scan Drive +5 Volts (Volts DC) |
| a1_sd_p15_v | 32-bit floating-point | None | AMSU-A1 Scan Drive +15 Volts (Volts DC) |

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|------------------------|-----------------------|------|--|
| a1_sd_m15_v | 32-bit floating-point | None | AMSU-A1 Scan Drive -15 Volts (Volts DC) |
| a1_plo_p15_v | 32-bit floating-point | None | AMSU-A1 Phase Locked Oscillator +15 Volts (Volts DC) |
| a1_plo_m15_v | 32-bit floating-point | None | AMSU-A1 Phase Locked Oscillator -15 Volts (Volts DC) |
| a1_rcvr_p8_v | 32-bit floating-point | None | AMSU-A1 Receiver +8 Volts (Volts DC) |
| a11_mxr_if_amp_p10_v | 32-bit floating-point | None | AMSU-A1-1 Mixer/IF AMP +10 Volts (Volts DC) |
| a12_mxr_if_amp_p10_v | 32-bit floating-point | None | AMSU-A1-2 Mixer/IF AMP +10 Volts (Volts DC) |
| a1_lo_ch6_p10_v | 32-bit floating-point | None | AMSU-A1 Local Oscillator Channel 6 +10 Volts (Volts DC) |
| a1_lo_ch7_p10_v | 32-bit floating-point | None | AMSU-A1 Local Oscillator Channel 7 +10 Volts (Volts DC) |
| a1_lo_ch15_p15_v | 32-bit floating-point | None | AMSU-A1 Local Oscillator Channel 15 +15 Volts (Volts DC) |
| a1_lo_ch3_p10_v | 32-bit floating-point | None | AMSU-A1 Local Oscillator Channel 3 +10 Volts (Volts DC) |
| a1_lo_ch4_p10_v | 32-bit floating-point | None | AMSU-A1 Local Oscillator Channel 4 +10 Volts (Volts DC) |
| a1_lo_ch5_p10_v | 32-bit floating-point | None | AMSU-A1 Local Oscillator Channel 5 +10 Volts (Volts DC) |
| a1_lo_ch8_p10_v | 32-bit floating-point | None | AMSU-A1 Local Oscillator Channel 8 +10 Volts (Volts DC) |
| a1_quiet_bus_curr | 32-bit floating-point | None | AMSU-A1 Quiet Bus Current (mA) |
| a11_noisy_pwr_bus_curr | 32-bit floating-point | None | AMSU-A1-1 Noisy Power Bus Current (mA) |
| a12_noisy_pwr_bus_curr | 32-bit floating-point | None | AMSU-A1-2 Noisy Power Bus Current (mA) |
| a2_UnitSerialNum | 16-bit integer | None | AMSU-A2 Unit serial number |
| a2_Ant_Full_Scan | 8-bit integer | None | AMSU-A2 Antenna in FullScan Mode |
| a2_Ant_Warm_Cal | 8-bit integer | None | AMSU-A2 Antenna in Warm Calibration Mode |
| a2_Ant_Cold_Cal | 8-bit integer | None | AMSU-A2 Antenna in Cold Calibration Mode |
| a2_Ant_Nadir | 8-bit integer | None | AMSU-A2 Antenna in Nadir Mode |
| a2_ColdCalPstion | 8-bit integer | None | AMSU-A2 Cold Calibration Position 1-4 (Binary 0-3) |
| a2_ResetProcessr | 8-bit integer | None | AMSU-A2 Reset C&DH Processor (command) |
| a2_ScannerPwr | 8-bit integer | None | AMSU-A2 Scanner Power, ON/Off |
| a2_ADC_LatchupFI | 8-bit integer | None | AMSU-A2 ADC Latchup Flag (Status) |
| a2_scan_motor_temp | 32-bit floating-point | None | AMSU-A2 Scan Motor Temperature (Celcius) |
| a2_feedhorn_temp | 32-bit floating-point | None | AMSU-A2 Feedhorn Temperature (Celcius) |
| a2_rf_diplexer_temp | 32-bit floating-point | None | AMSU-A2 RF Diplexer Temperature (Celcius) |
| a2_mxr_if_amp_ch1_temp | 32-bit floating-point | None | AMSU-A2 Mixer/IF Amp/Channel 1 Temperature (Celcius) |
| a2_mxr_if_amp_ch2_temp | 32-bit floating-point | None | AMSU-A2 Mixer/IF Amp/Channel 2 Temperature (Celcius) |
| a2_lo_ch1_temp | 32-bit floating-point | None | AMSU-A2 Local Oscillator Channel 1 Temperature (Celcius) |
| a2_lo_ch2_temp | 32-bit floating-point | None | AMSU-A2 Local Oscillator Channel 2 Temperature (Celcius) |
| a2_sp_1553_if_temp | 32-bit floating-point | None | AMSU-A2 S.P. (1553 I/F) Temperature (Celcius) |
| a2_subr_temp | 32-bit floating-point | None | AMSU-A2 Subreflector Temperature (Celcius) |
| a2_dc_dc_conv_temp | 32-bit floating-point | None | AMSU-A2 DC/DC Converter Temperature (Celcius) |

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|-------------------------|-----------------------|------|---|
| a2_rf_shelf_temp | 32-bit floating-point | None | AMSU-A2 RF Shelf Temperature (Celcius) |
| a2_det_preamp_temp | 32-bit floating-point | None | AMSU-A2 Detector/PreAmp Temperature (Celcius) |
| a2_warm_load_1_temp | 32-bit floating-point | None | AMSU-A2 Warm Load 1 Temperature (Celcius) |
| a2_warm_load_2_temp | 32-bit floating-point | None | AMSU-A2 Warm Load 2 Temperature (Celcius) |
| a2_warm_load_3_temp | 32-bit floating-point | None | AMSU-A2 Warm Load 3 Temperature (Celcius) |
| a2_warm_load_4_temp | 32-bit floating-point | None | AMSU-A2 Warm Load 4 Temperature (Celcius) |
| a2_warm_load_5_temp | 32-bit floating-point | None | AMSU-A2 Warm Load 5 Temperature (Celcius) |
| a2_warm_load_6_temp | 32-bit floating-point | None | AMSU-A2 Warm Load 6 Temperature (Celcius) |
| a2_warm_load_c_temp | 32-bit floating-point | None | AMSU-A2 Warm Load Center Temperature (Celcius) |
| a2_prt_ref_v | 32-bit floating-point | None | AMSU-A2 PRT Reference Voltage (Counts) |
| a2_sp_p5_v | 32-bit floating-point | None | AMSU-A2 Signal Processor +5 Volts (Volts DC) |
| a2_sp_p15_v | 32-bit floating-point | None | AMSU-A2 Signal Processor +15 Volts (Volts DC) |
| a2_sp_m15_v | 32-bit floating-point | None | AMSU-A2 Signal Processor -15 Volts (Volts DC) |
| a2_sd_p5_v | 32-bit floating-point | None | AMSU-A2 Scan Drive +5 Volts (Volts DC) |
| a2_sd_p15_v | 32-bit floating-point | None | AMSU-A2 Scan Drive +15 Volts (Volts DC) |
| a2_sd_m15_v | 32-bit floating-point | None | AMSU-A2 Scan Drive -15 Volts (Volts DC) |
| a2_mxr_if_amp_p10_v | 32-bit floating-point | None | AMSU-A2 Mixer/IF AMP +10 Volts (Volts DC) |
| a2_lo_ch1_p10_v | 32-bit floating-point | None | AMSU-A2 Local Oscillator Channel 1 +10 Volts (Volts DC) |
| a2_lo_ch2_p10_v | 32-bit floating-point | None | AMSU-A2 Local Oscillator Channel 2 +10 Volts (Volts DC) |
| a2_quiet_bus_curr | 32-bit floating-point | None | AMSU-A2 Quiet Bus Current (mA) |
| a2_noisy_pwr_bus_curr | 32-bit floating-point | None | AMSU-A2 Noisy Power Bus Current (mA) |
| psv_a11_rcvr1_temp | 32-bit floating-point | None | Passive analog A1-1 RF Shelf Temperature #1 (Celcius) |
| psv_a11_rcvr2_temp | 32-bit floating-point | None | Passive analog A1-1 RF Shelf Temperature #2 (Celcius) |
| psv_a11_scan_motor_temp | 32-bit floating-point | None | Passive analog A1-1 Scan Motor Temperature (Celcius) |
| psv_a12_scan_motor_temp | 32-bit floating-point | None | Passive analog A1-2 Scan Motor Temperature (Celcius) |
| psv_a12_rcvr1_temp | 32-bit floating-point | None | Passive analog A1-2 RF Shelf Temperature #1 (Celcius) |
| psv_a12_rcvr2_temp | 32-bit floating-point | None | Passive analog A1-2 RF Shelf Temperature #2 (Celcius) |
| psv_a11_warm_load_temp | 32-bit floating-point | None | Passive analog A1-1 Warm Load Temperature (Celcius) |
| psv_a12_warm_load_temp | 32-bit floating-point | None | Passive analog A1-2 Warm Load Temperature (Celcius) |
| psv_a2_scan_motor_temp | 32-bit floating-point | None | Passive analog A2 Scan Motor Temperature (Celcius) |
| psv_a2_warm_load_temp | 32-bit floating-point | None | Passive analog A2 Warm Load Temperature (Celcius) |
| psv_a2_rcvr1_temp | 32-bit floating-point | None | Passive analog A2 RF Shelf Temperature #1 (Celcius) |

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| psv_a2_rcvr2_temp | 32-bit floating-point | None | Passive analog A2 RF Shelf Temperature #2 (Celcius) |
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Size: 34560 bytes (0.0 MB) per 45-scanset granule

Full Swath Data Fields

These fields appear for every footprint of every scanline in the granule (GeoTrack * GeoXTrack times)

| Name | Type | Extra Dimensions | Explanation |
|-------------|-------------------------|--------------------------|---|
| scanang | 32-bit floating-point | None | Scanning angle of AMSU-A instrument with respect to the AMSU-A instrument for this footprint (-180.0 ... 180.0, negative at start of scan, 0 at nadir) |
| scanang_a11 | 32-bit floating-point | AnglesPerFootprint (= 2) | Scanning angles (before & after) of AMSU-A1-1 antenna for this footprint (AMSU-A1-1 is AMSU-A channels 6, 7, 9-15) (-180.0 ... 180.0) |
| scanang_a12 | 32-bit floating-point | AnglesPerFootprint (= 2) | Scanning angles (before & after) of AMSU-A1-2 antenna for this footprint (AMSU-A1-2 is AMSU-A channels 3, 4, 5, and 8) (-180.0 ... 180.0) |
| scanang_a2 | 32-bit floating-point | AnglesPerFootprint (= 2) | Scanning angles (before & after) of AMSU-A2 antenna for this footprint (AMSU-A2 is AMSU-A channels 1 & 2) (-180.0 ... 180.0) |
| scanang_qa | 8-bit unsigned integer | None | bit 0: a_11 reading 1 out of rangebit 1: a_11 reading 2 out of rangebit 2: a_12 reading 1 out of rangebit 3: a_12 reading 2 out of rangebit 4: a_2 reading 1 out of rangebit 5: a_2 reading 2 out of rangebit 6: unusedbit 7: all the readings are bad |
| ftptgeoqa | 32-bit unsigned integer | None | Footprint Geolocation QA flags: bit 0 (LSB): bad input value; bit 1: PGS_TD_TAItUTC() returned PGSTD_E_NO_LEAP_SECS; bit 2: PGS_TD_TAItUTC() returned PGS_E_TOOLKIT; bit 3: PGS_CSC_GetFOV_Pixel() returned PGSCSC_W_MISS_EARTH; bit 4: PGS_CSC_GetFOV_Pixel() returned PGSTD_E_SC_TAG_UNKNOWN; bit 5: PGS_CSC_GetFOV_Pixel() returned PGSCSC_W_ZERO_PIXEL_VECTOR; bit 6: PGS_CSC_GetFOV_Pixel() returned PGSCSC_W_BAD_EPH_FOR_PIXEL; bit 7: PGS_CSC_GetFOV_Pixel() returned PGSCSC_W_INSTRUMENT_OFF_BOARD; bit 8: PGS_CSC_GetFOV_Pixel() returned PGSCSC_W_BAD_ACCURACY_FLAG; bit 9: PGS_CSC_GetFOV_Pixel() returned PGSCSC_E_BAD_ARRAY_SIZE; bit 10: PGS_CSC_GetFOV_Pixel() returned PGSCSC_W_DEFAULT_EARTH_MODEL; bit 11: PGS_CSC_GetFOV_Pixel() returned PGSCSC_W_DATA_FILE_MISSING; bit 12: PGS_CSC_GetFOV_Pixel() returned PGSCSC_E_NEG_OR_ZERO_RAD; bit 13: PGS_CSC_GetFOV_Pixel() returned PGSMEM_E_NO_MEMORY; bit 14: PGS_CSC_GetFOV_Pixel() returned PGSTD_E_NO_LEAP_SECS; bit 15: PGS_CSC_GetFOV_Pixel() returned PGSTD_E_TIME_FMT_ERROR; bit 16: PGS_CSC_GetFOV_Pixel() returned PGSTD_E_TIME_VALUE_ERROR; bit 17: PGS_CSC_GetFOV_Pixel() returned PGSCSC_W_PREDICTED_UT1; bit 18: PGS_CSC_GetFOV_Pixel() returned PGSTD_E_NO_UT1_VALUE; bit 19: PGS_CSC_GetFOV_Pixel() returned PGS_E_TOOLKIT; bit 20: PGS_CSC_GetFOV_Pixel() returned PGSEPH_E_BAD_EPHEM_FILE_HDR; bit 21: PGS_CSC_GetFOV_Pixel() returned PGSEPH_E_NO_SC_EPHEM_FILE; bit 22-31: not used |
| zengeoqa | 16-bit unsigned integer | None | Satellite zenith Geolocation QA flags: bit 0 (LSB): (Spacecraft) bad input value; bit 1: PGS_CSC_ZenithAzimuth(S/C) returned PGSCSC_W_BELOW_HORIZON; bit 2: PGS_CSC_ZenithAzimuth(S/C) returned PGSCSC_W_UNDEFINED_AZIMUTH; bit 3: PGS_CSC_ZenithAzimuth(S/C) returned PGSCSC_W_NO_REFRACTION; bit 4: PGS_CSC_ZenithAzimuth(S/C) returned PGSCSC_E_INVALID_VECTAG; bit 5: PGS_CSC_ZenithAzimuth(S/C) returned PGSCSC_E_LOOK_PT_ALTIT_RANGE; bit 6: PGS_CSC_ZenithAzimuth(S/C) returned PGSCSC_E_ZERO_INPUT_VECTOR; bit 7: PGS_CSC_ZenithAzimuth(S/C) returned PGS_E_TOOLKIT; bit 8: (Sun) bad input value; bit 9: (suppressed) PGS_CSC_ZenithAzimuth(Sun) returned PGSCSC_W_BELOW_HORIZON (This is not an error condition - the sun is below the horizon at night); bit 10: PGS_CSC_ZenithAzimuth(Sun) returned PGSCSC_W_UNDEFINED_AZIMUTH; bit 11: PGS_CSC_ZenithAzimuth(Sun) returned PGSCSC_W_NO_REFRACTION; bit 12: PGS_CSC_ZenithAzimuth(Sun) returned PGSCSC_E_INVALID_VECTAG; bit 13: PGS_CSC_ZenithAzimuth(Sun) returned PGSCSC_E_LOOK_PT_ALTIT_RANGE; bit 14: PGS_CSC_ZenithAzimuth(Sun) returned PGSCSC_E_ZERO_INPUT_VECTOR; bit 15: PGS_CSC_ZenithAzimuth(Sun) returned PGS_E_TOOLKIT |
| demgeoqa | 16-bit unsigned integer | None | Digital Elevation Model (DEM) Geolocation QA flags: bit 0 (LSB): bad input value; bit 1: Could not allocate memory; bit 2: Too close to North or South pole. Excluded; bit 3: Layer resolution incompatibility. Excluded; bit 4: Any DEM Routine (elev) returned PGSDDEM_E_IMPROPER_TAG; bit 5: Any DEM Routine (elev) returned PGSDDEM_E_CANNOT_ACCESS_DATA; bit 6: Any DEM Routine (land/water) returned PGSDDEM_E_IMPROPER_TAG; bit 7: Any DEM Routine (land/water) returned PGSDDEM_E_CANNOT_ACCESS_DATA; bit 8: Reserved for future layers; bit 9: Reserved for future layers; bit 10: PGS_DEM_GetRegion(elev) returned PGSDDEM_M_FILLVALUE_INCLUDED; bit 11: PGS_DEM_GetRegion(land/water) returned PGSDDEM_M_FILLVALUE_INCLUDED; bit 12: Reserved for future layers; bit 13: PGS_DEM_GetRegion(all) returned PGSDDEM_M_MULTIPLE_RESOLUTIONS; bit 14: PGS_CSC_GetFOV_Pixel() returned any 'W' class return code except PGSCSC_W_PREDICTED_UT1; bit 15: PGS_CSC_GetFOV_Pixel() returned any 'E' class return code |
| satzen | 32-bit floating-point | None | Spacecraft zenith angle (0.0 ... 180.0) degrees from zenith (measured relative to the geodetic vertical on the reference (WGS84) spheroid and including corrections outlined in EOS SDP toolkit for normal accuracy.) |
| satazi | 32-bit floating-point | None | Spacecraft azimuth angle (-180.0 ... 180.0) degrees E of N GEO) |
| solzen | 32-bit floating-point | None | Solar zenith angle (0.0 ... 180.0) degrees from zenith (measured relative to the geodetic vertical on the reference (WGS84) spheroid and including corrections outlined in EOS |

| | | | |
|--------------------|-------------------------|----------------|--|
| | | | SDP toolkit for normal accuracy.) |
| solazi | 32-bit floating-point | None | Solar azimuth angle (-180.0 ... 180.0) degrees E of N GEO) |
| sun_glint_distance | 16-bit integer | None | Distance (km) from footprint center to location of the sun glint (-9999 for unknown, 30000 for no glint visible because spacecraft is in Earth's shadow) |
| topog | 32-bit floating-point | None | Mean topography in meters above reference ellipsoid |
| topog_err | 32-bit floating-point | None | Error estimate for topog |
| landFrac | 32-bit floating-point | None | Fraction of spot that is land (0.0 ... 1.0) |
| landFrac_err | 32-bit floating-point | None | Error estimate for landFrac |
| counts | 16-bit unsigned integer | Channel (= 15) | raw counts (data numbers) for each channel |

Size: 136350 bytes (0.1 MB) per 45-scanset granule

Calibration Swath Data Fields

These fields appear for every calibration footprint of every scanline in the granule (GeoTrack * CalXTrack times)

| Name | Type | Extra Dimensions | Explanation |
|------------|-------------------------|------------------|--|
| cal_counts | 16-bit unsigned integer | Channel (= 15) | Raw counts (data numbers) for each channel |
| cal_tai | 64-bit floating-point | None | TAI time of calibration footprint (floating-point elapsed seconds since start of 1993) |

Size: 6840 bytes (0.0 MB) per 45-scanset granule

Total File Size (plus storage for dimensions and other HDF-EOS overhead): 210359 bytes (0.2 MB) per 45-scanset granule = 50.5 MB per day

Special AIRS Types

Unlimited Engineering Struct: This type is used for engineering data fields for which there are NOT known "yellow" limits

| Field Name | Type | Explanation |
|------------|-----------------------|---|
| min | 32-bit floating-point | Minimum value field takes on in granule (not valid when num = 0) |
| max | 32-bit floating-point | Maximum value field takes on in granule (not valid when num = 0) |
| mean | 32-bit floating-point | Mean of values field takes on in granule (not valid when num = 0) |
| dev | 32-bit floating-point | Standard Deviation of values field takes on in granule (not valid when num = 0) |
| num | 32-bit integer | Count of occurrences of field in granule (not including those counted in num_bad) |
| num_bad | 32-bit integer | Count of occasions on which field takes on invalid flag value (-9999) in granule |
| max_track | 32-bit integer | GeoTrack index (counting from 1) where max was found |
| max_xtrack | 32-bit integer | GeoXTrack index (counting from 1) where max was found |
| min_track | 32-bit integer | GeoTrack index (counting from 1) where min was found |
| min_xtrack | 32-bit integer | GeoXTrack index (counting from 1) where min was found |

AMSU Packet Counts: This type tracks counts of packets received during an interval by conditions under which they were received

| Field Name | Type | Explanation |
|--------------|----------------|---|
| missing_in | 16-bit integer | Count of packets missing between packets that are present |
| missing_ends | 16-bit integer | Count of packets missing at beginning or end of granule timespan: missing packets for which there are either no existing packets before them or no existing packets after them. (When all data is missing all packets will be counted here) |
| at_noop | 16-bit integer | Count of packets for which the spacecraft mode is not operational for some or all of the packet interval |
| illegal_mode | 16-bit integer | Count of packets for which there was an illegal instrument mode |
| special_cal | 16-bit integer | Count of packets for which the instrument was in a special calibration mode (Nadir mode, cold cal (space view) mode, or warm cal mode) |

| | | |
|-------------------|----------------|--|
| invalid_data | 16-bit integer | Count of invalid packets (ADC latchup flag = 1, Mode disagrees with APID, scanner power off for all three scanners. For AMSU-A1 also lock status = 0 for selected PLO) |
| partially_invalid | 16-bit integer | Count of packets for which the data is partially invalid (AMSU-A1 only: scanner power off for one of the two scanners) |
| checksum_err | 16-bit integer | Count of packets with an error detected in the checksum |
| good | 16-bit integer | Count of packets not counted in any other category |

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A1-7. L1A HSB Interface Specification

Interface Specification Version 3.0.4.0
2003-05-19

ESDT ShortName = "AIRHSCI"

Swath Name = "L1A_HSB"

Level = "level1A"

Footprints = 90

scanlines per scanset = 3

Dimensions

These fields define all dimensions that can be used for HDF-EOS swath fields.

The names "GeoTrack" and "GeoXTrack" have a special meaning for this document: "Cross-Track" data fields have a hidden dimension of "GeoXTrack"; "Along-Track" data fields have a hidden dimension of "GeoTrack"; "Full Swath Data Fields have hidden dimensions of both "GeoTrack" and "GeoXTrack".

| Name | Value | Explanation |
|-------------|--------------------------|---|
| GeoXTrack | 90 | Dimension across track for footprint positions. Same as number of footprints per scanline. -- starting at the left and increasing towards the right as you look along the satellite's path |
| GeoTrack | # of scan lines in swath | Dimension along track for footprint positions. Same as number of scanlines in granule. Parallel to the satellite's path, increasing with time. (Nominally 45 for Level-2, AMSU-A, and AIRS/Vis low-rate engineering; 135 for AIRS/Vis and HSB high-rate quantities) |
| Channel | 5 | Dimension of channel array (Channel 1: Deleted 89.0 GHz channel: always invalid; Ch 2: 150.0 GHz; Ch 3: f0 +/- 1.0 GHz; Ch 4: f0 +/- 3.0 GHz; Ch 5: f0 +/- 7.0 GHz (f0 = 183.31 GHz)) |
| CalXTrack | 8 | Dimension "across" track for calibration footprint positions. Same as number of calibration footprints per scanline. (NUM_FOOTPRINTS_HSB_CALIB) (Footprints are ordered: 1-4: spaceviews; 5-8: blackbody radiometric calibration source) |
| SpaceXTrack | 4 | Dimension "across" track for spaceview calibration footprint positions in order of observation time. (NUM_FOOTPRINTS_HSB_SPACE) |
| BBXTrack | 4 | Dimension "across" track for blackbody calibration footprint positions in order of observation time. (NUM_FOOTPRINTS_HSB_BB) |

Geolocation Fields

These fields appear for every footprint (GeoTrack * GeoXTrack times) and correspond to footprint center coordinates and "shutter" time.

| Name | Explanation |
|-----------|--|
| Latitude | Footprint boresight geodetic Latitude in degrees North (-90.0 ... 90.0) |
| Longitude | Footprint boresight geodetic Longitude in degrees East (-180.0 ... 180.0) |
| Time | Footprint "shutter" TAI Time: floating-point elapsed seconds since Jan 1, 1993 |

Size: 291600 bytes (0.3 MB) per 45-scanset granule

Attributes

These fields appear only once per granule

| Name | Type | Extra Dimensions | Explanation |
|------------------|----------------------------|------------------|---|
| processing_level | string of 8-bit characters | None | Zero-terminated character string denoting processing level ("level1A") |
| instrument | string of 8-bit characters | None | Zero-terminated character string denoting instrument ("HSB") |
| DayNightFlag | string of 8-bit characters | None | Zero-terminated character string denoting granule as day and/or night: (Always "Day", "Night", or "Both") |
| AutomaticQAFlag | string of 8-bit characters | None | Zero-terminated character string denoting granule data quality: (Always "Passed", "Failed", or "Suspect") |
| NumTotalData | 32-bit integer | None | Total number of expected HSB packets |
| NumProcessData | 32-bit integer | None | Number of HSB packets which are present and can be processed routinely (state = 0) |
| NumSpecialData | 32-bit integer | None | Number of HSB packets which are present and can be processed only as a special test (state = 1) |

| | | | |
|-----------------|----------------------------|------|---|
| NumBadData | 32-bit integer | None | Number of HSB packets which are present but cannot be processed (state = 2) |
| NumMissingData | 32-bit integer | None | Number of expected HSB packets which are not present (state = 3) |
| NumLandSurface | 32-bit integer | None | Number of scene footprints for which the surface is more than 90% land |
| NumOceanSurface | 32-bit integer | None | Number of scene footprints for which the surface is less than 10% land |
| node_type | string of 8-bit characters | None | Zero-terminated character string denoting whether granule is ascending, descending, or pole-crossing: ("Ascending" and "Descending" for entirely ascending or entirely descending granules, or "NorthPole" or "SouthPole" for pole-crossing granules) |
| start_year | 32-bit integer | None | Year in which granule started, UTC (e.g. 1999) |
| start_month | 32-bit integer | None | Month in which granule started, UTC (1 ... 12) |
| start_day | 32-bit integer | None | Day of month in which granule started, UTC (1 ... 31) |
| start_hour | 32-bit integer | None | Hour of day in which granule started, UTC (0 ... 23) |
| start_minute | 32-bit integer | None | Minute of hour in which granule started, UTC (0 ... 59) |
| start_sec | 32-bit floating-point | None | Second of minute in which granule started, UTC (0.0 ... 59.0) |
| start_orbit | 32-bit integer | None | Orbit number of mission in which granule started |
| end_orbit | 32-bit integer | None | Orbit number of mission in which granule ended |
| orbit_path | 32-bit integer | None | Orbit path of start orbit (1 ... 233 as defined by EOS project) |
| start_orbit_row | 32-bit integer | None | Orbit row at start of granule (1 ... 248 as defined by EOS project) |
| end_orbit_row | 32-bit integer | None | Orbit row at end of granule (1 ... 248 as defined by EOS project) |
| granule_number | 32-bit integer | None | Number of granule within day (1 ... 240) |
| num_scansets | 32-bit integer | None | Number of scansets in granule (1 ... 45) |
| num_scanlines | 32-bit integer | None | Number of scanlines in granule (3 * num_scansets) |
| start_Latitude | 64-bit floating-point | None | Geodetic Latitude of spacecraft at start of granule in degrees North (-90.0 ... 90.0) |
| start_Longitude | 64-bit floating-point | None | Geodetic Longitude of spacecraft at start of granule in degrees East (-180.0 ... 180.0) |
| start_Time | 64-bit floating-point | None | TAI Time at start of granule (floating-point elapsed seconds since start of 1993) |
| end_Latitude | 64-bit floating-point | None | Geodetic Latitude of spacecraft at end of granule in degrees North (-90.0 ... 90.0) |
| end_Longitude | 64-bit floating-point | None | Geodetic Longitude of spacecraft at end of granule in degrees East (-180.0 ... 180.0) |
| end_Time | 64-bit floating-point | None | TAI Time at end of granule (floating-point elapsed seconds since start of 1993) |
| eq_x_longitude | 32-bit floating-point | None | Longitude of spacecraft at southward equator crossing nearest granule start in degrees East (-180.0 ... 180.0) |
| eq_x_tai | 64-bit floating-point | None | Time of eq_x_longitude in TAI units (floating-point elapsed seconds since start of 1993) |
| orbitgeoqa | 32-bit unsigned integer | None | Orbit Geolocation QA: bit 0 (LSB): bad input value (last scanline); bit 1: bad input value (first scanline); bit 2: PGS_EPH_GetEphMet() returned PGSEPH_E_NO_SC_EPHEM_FILE; bit 3: PGS_EPH_GetEphMet() returned PGSEPH_E_BAD_ARRAY_SIZE; bit 4: PGS_EPH_GetEphMet() returned PGSTD_E_TIME_FMT_ERROR; bit 5: PGS_EPH_GetEphMet() returned PGSTD_E_TIME_VALUE_ERROR; bit 6: PGS_EPH_GetEphMet() returned PGSTD_E_SC_TAG_UNKNOWN; bit 7: PGS_EPH_GetEphMet() returned PGS_E_TOOLKIT; bit 8: PGS_TD_UTCtoTAI() returned PGSTD_E_NO_LEAP_SECS; bit 9: PGS_TD_UTCtoTAI() returned PGSTD_E_TIME_FMT_ERROR; bit 10: PGS_TD_UTCtoTAI() returned PGSTD_E_TIME_VALUE_ERROR; bit 11: PGS_TD_UTCtoTAI() returned PGS_E_TOOLKIT; bit 12: PGS_CSC_DayNight() returned PGSTD_E_NO_LEAP_SECS; bit 13: PGS_CSC_DayNight() returned PGSCSC_E_INVALID_LIMITTAG; bit 14: PGS_CSC_DayNight() returned PGSCSC_E_BAD_ARRAY_SIZE; bit 15: PGS_CSC_DayNight() returned PGSCSC_W_ERROR_IN_DAYNIGHT; bit 16: PGS_CSC_DayNight() returned PGSCSC_W_BAD_TRANSFORM_VALUE; bit 17: PGS_CSC_DayNight() returned PGSCSC_W_BELOW_HORIZON; bit 18: PGS_CSC_DayNight() returned PGSCSC_W_PREDICTED_UT1; bit 19: PGS_CSC_DayNight() returned PGSTD_E_NO_UT1_VALUE; bit 20: PGS_CSC_DayNight() returned PGSTD_E_BAD_INITIAL_TIME; bit 21: PGS_CSC_DayNight() returned PGSCBP_E_TIME_OUT_OF_RANGE; bit 22: PGS_CSC_DayNight() returned PGSCBP_E_UNABLE_TO_OPEN_FILE; bit 23: PGS_CSC_DayNight() returned PGSMEM_E_NO_MEMORY; bit 24: PGS_CSC_DayNight() returned PGS_E_TOOLKIT; bit 25-31: not used |
| num_satgeoqa | 16-bit integer | None | Number of scans with problems in satgeoqa |
| num_glintgeoqa | 16-bit integer | None | Number of scans with problems in glintgeoqa |
| num_moongoqa | 16-bit integer | None | Number of scans with problems in moongoqa |

| | | | |
|-------------------|-------------------------------|------|---|
| num_ftptgeoqa | 16-bit integer | None | Number of footprints with problems in ftptgeoqa |
| num_zengeoqa | 16-bit integer | None | Number of footprints with problems in zengeoqa |
| num_demgeoqa | 16-bit integer | None | Number of footprints with problems in demgeoqa |
| num_fpe | 16-bit integer | None | Number of floating point errors |
| LonGranuleCen | 16-bit integer | None | Geodetic Longitude of the center of the granule in degrees East (-180 ... 180) |
| LatGranuleCen | 16-bit integer | None | Geodetic Latitude of the center of the granule in degrees North (-90 ... 90) |
| LocTimeGranuleCen | 16-bit integer | None | Local solar time at the center of the granule in minutes past midnight (0 ... 1439) |
| apid_342_cnt | HSB Packet Counts (see below) | None | Counts of packets of APID 342 (HSB Science) by condition |

Size: 199 bytes (0.0 MB) per granule

Along-Track Data Fields

These fields appear once per scanline (GeoTrack times)

| Name | Type | Extra Dimensions | Explanation |
|------------|-------------------------|------------------|--|
| satheight | 32-bit floating-point | None | Satellite altitude at nadirTAI in km above reference ellipsoid (e.g. 725.2) |
| satroll | 32-bit floating-point | None | Satellite attitude roll angle at nadirTAI (-180.0 ... 180.0 angle about the +x (roll) ORB axis, +x axis is positively oriented in the direction of orbital flight completing an orthogonal triad with y and z.) |
| satpitch | 32-bit floating-point | None | Satellite attitude pitch angle at nadirTAI (-180.0 ... 180.0 angle about +y (pitch) ORB axis, +y axis is oriented normal to the orbit plane with the positive sense opposite to that of the orbit's angular momentum vector H.) |
| satyaw | 32-bit floating-point | None | Satellite attitude yaw angle at nadirTAI (-180.0 ... 180.0 angle about +z (yaw) axis, +z axis is positively oriented earthward parallel to the satellite radius vector R from the spacecraft center of mass to the center of the Earth.) |
| satgeoqa | 32-bit unsigned integer | None | Satellite Geolocation QA flags: bit 0 (LSB): bad input value; bit 1: PGS_TD_TAItUTC() returned PGSTD_E_NO_LEAP_SECS; bit 2: PGS_TD_TAItUTC() returned PGS_E_TOOLKIT; bit 3: PGS_EPH_EphemAttit() returned PGSEPH_W_BAD_EPHEM_VALUE; bit 4: PGS_EPH_EphemAttit() returned PGSEPH_E_BAD_EPHEM_FILE_HDR; bit 5: PGS_EPH_EphemAttit() returned PGSEPH_E_NO_SC_EPHEM_FILE; bit 6: PGS_EPH_EphemAttit() returned PGSEPH_E_NO_DATA_REQUESTED; bit 7: PGS_EPH_EphemAttit() returned PGSTD_E_SC_TAG_UNKNOWN; bit 8: PGS_EPH_EphemAttit() returned PGSEPH_E_BAD_ARRAY_SIZE; bit 9: PGS_EPH_EphemAttit() returned PGSTD_E_TIME_FMT_ERROR; bit 10: PGS_EPH_EphemAttit() returned PGSTD_E_TIME_VALUE_ERROR; bit 11: PGS_EPH_EphemAttit() returned PGSTD_E_NO_LEAP_SECS; bit 12: PGS_EPH_EphemAttit() returned PGS_E_TOOLKIT; bit 13: PGS_CSC_ECIttoECR() returned PGSCSC_W_BAD_TRANSFORM_VALUE; bit 14: PGS_CSC_ECIttoECR() returned PGSCSC_E_BAD_ARRAY_SIZE; bit 15: PGS_CSC_ECIttoECR() returned PGSTD_E_NO_LEAP_SECS; bit 16: PGS_CSC_ECIttoECR() returned PGSTD_E_TIME_FMT_ERROR; bit 17: PGS_CSC_ECIttoECR() returned PGSTD_E_TIME_VALUE_ERROR; bit 18: unused (set to zero); bit 19: PGS_CSC_ECIttoECR() returned PGSTD_E_NO_UT1_VALUE; bit 20: PGS_CSC_ECIttoECR() returned PGS_E_TOOLKIT; bit 21: PGS_CSC_ECRtoGEO() returned PGSCSC_W_TOO_MANY_ITERS; bit 22: PGS_CSC_ECRtoGEO() returned PGSCSC_W_INVALID_ALTITUDE; bit 23: PGS_CSC_ECRtoGEO() returned PGSCSC_W_SPHERE_BODY; bit 24: PGS_CSC_ECRtoGEO() returned PGSCSC_W_LARGE_FLATTENING; bit 25: PGS_CSC_ECRtoGEO() returned PGSCSC_W_DEFAULT_EARTH_MODEL; bit 26: PGS_CSC_ECRtoGEO() returned PGSCSC_E_BAD_EARTH_MODEL; bit 27: PGS_CSC_ECRtoGEO() returned PGS_E_TOOLKIT; bit 28-31: not used |
| glintgeoqa | 16-bit unsigned integer | None | Glint Geolocation QA flags: bit 0 (LSB): bad input value; bit 1: glint location in Earth's shadow; bit 2: glint calculation not converging; bit 3: glint location sun vs. satellite zenith mismatch; bit 4: glint location sun vs. satellite azimuth mismatch; bit 5: bad glint location; bit 6: PGS_CSC_ZenithAzimuth() returned any 'W' class return code; bit 7: PGS_CSC_ZenithAzimuth() returned any 'E' class return code; bit 8: PGS_CBP_Earth_CB_Vector() returned any 'W' class return code; bit 9: PGS_CBP_Earth_CB_Vector() returned any 'E' class return code; bit 10: PGS_CSC_ECIttoECR() returned any 'W' class return code except PGSCSC_W_PREDICTED_UT1 (for Glint); bit 11: PGS_CSC_ECIttoECR() returned any 'E' class return code (for Glint); bit 12: PGS_CSC_ECRtoGEO() returned any 'W' class return code (for Glint); bit 13: PGS_CSC_ECRtoGEO() returned any 'E' class return code (for Glint); bit 14: PGS_CSC_ECIttoECR() returned any 'W' class return code except PGSCSC_W_PREDICTED_UT1; bit 15: PGS_CSC_ECIttoECR() returned any 'E' class return code |
| moongeoa | 16-bit unsigned integer | None | Moon Geolocation QA flags: bit 0 (LSB): bad input value; bit 1: PGS_TD_TAItUTC() returned PGSTD_E_NO_LEAP_SECS; bit 2: PGS_TD_TAItUTC() returned PGS_E_TOOLKIT; bit 3: PGS_CBP_Sat_CB_Vector() returned PGSCBP_W_BELOW_SURFACE; bit 4: PGS_CBP_Sat_CB_Vector() returned PGSCBP_W_BAD_CB_VECTOR; bit 5: PGS_CBP_Sat_CB_Vector() returned PGSCBP_E_BAD_ARRAY_SIZE; bit 6: PGS_CBP_Sat_CB_Vector() returned PGSCBP_E_INVALID_CB_ID; bit 7: PGS_CBP_Sat_CB_Vector() returned PGSMFM_F_NO_MFMORY; bit 8: PGS_CBP_Sat_CB_Vector() returned |

| | | | |
|-------------------|-----------------------|------|--|
| | | | PGSCBP_E_UNABLE_TO_OPEN_FILE; bit 9: PGS_CBP_Sat_CB_Vector() returned PGSTD_E_BAD_INITIAL_TIME; bit 10: PGS_CBP_Sat_CB_Vector() returned PGSCBP_E_TIME_OUT_OF_RANGE; bit 11: PGS_CBP_Sat_CB_Vector() returned PGSTD_E_SC_TAG_UNKNOWN; bit 12: PGS_CBP_Sat_CB_Vector() returned PGSEPH_E_BAD_EPHEM_FILE_HDR; bit 13: PGS_CBP_Sat_CB_Vector() returned PGSEPH_E_NO_SC_EPHEM_FILE; bit 14: PGS_CBP_Sat_CB_Vector() returned PGS_E_TOOLKIT; bit 15: not used |
| nadirTAI | 64-bit floating-point | None | TAI time at which instrument is nominally looking directly down. (between footprints 15 & 16 for AMSU or between footprints 45 & 46 for AIRS/Vis & HSB) (floating-point elapsed seconds since start of 1993) |
| sat_lat | 64-bit floating-point | None | Satellite geodetic latitude in degrees North (-90.0 ... 90.0) |
| sat_lon | 64-bit floating-point | None | Satellite geodetic longitude in degrees East (-180.0 ... 180.0) |
| scan_node_type | 8-bit integer | None | 'A' for ascending, 'D' for descending, 'N' for North-Polar, 'S' for South-Polar |
| glintlat | 32-bit floating-point | None | Solar glint geodetic latitude in degrees North at nadirTAI (-90.0 ... 90.0) |
| glintlon | 32-bit floating-point | None | Solar glint geodetic longitude in degrees East at nadirTAI (-180.0 ... 180.0) |
| state | 32-bit integer | None | Data state: 0:Process, 1:Special, 2:Erroneous, 3:Missing |
| MDE_Power | 8-bit integer | None | Motor Drive Electronics Power (1=ON) |
| ProcessrCkFlg | 8-bit integer | None | Processor Check Flag |
| ScanCntl_Stat | 8-bit integer | None | Scan Control Status |
| PixlDataInvlD | 8-bit integer | None | Pixel Data Invalid Flag |
| ScanSyncFlag | 8-bit integer | None | Scan Synchronization Flag |
| ModeTransFlag | 8-bit integer | None | Mode Transition Flag |
| Module_ID | 8-bit integer | None | Module ID: EM,PFM,FM2,FM3 |
| RAM_Check | 8-bit integer | None | RAM Check (1=Failed) |
| ROM_Check | 8-bit integer | None | ROM Check (1=Failed) |
| MemChkStatus | 8-bit integer | None | Memory Check Status (1=Enabled) |
| SpacViewSelct | 8-bit integer | None | Space View Selected |
| Chnl_1820Rly5 | 8-bit integer | None | Channel 18,19,20 Relay 5 (1=ON) |
| Chnl_17Relay4 | 8-bit integer | None | Channel 17 Relay 4 (1=ON) |
| Stepped_Mode | 8-bit integer | None | Stepped Mode (1=YES) |
| Investgt_Mode | 8-bit integer | None | Investigation Mode (1=YES) |
| ParkSpac_View | 8-bit integer | None | Parked in Space View (1=YES) |
| ParkNadr_View | 8-bit integer | None | Parked in Nadir View (1=YES) |
| ParkTrgt_View | 8-bit integer | None | Parked in Target View (1=YES) |
| ScanNorm_Mode | 8-bit integer | None | Scan Normal Mode (1=YES) |
| Srvl_Htr_Rly2 | 8-bit integer | None | Survival Heater Relay 2 (1=ON) |
| PwrRly_Status | 8-bit integer | None | Power Relay 1 Status (1=ON) |
| mixer_17_temp | 32-bit floating-point | None | Mixer 17 Temperature (Celcius) |
| mixer_181920_temp | 32-bit floating-point | None | Mixer 18/19/20 Temperature (Celcius) |
| fet_amp_17_temp | 32-bit floating-point | None | FET Amplifier 17 Temperature (Celcius) |
| fet_amp_18_temp | 32-bit floating-point | None | FET Amplifier 18 Temperature (Celcius) |
| fet_amp_19_temp | 32-bit floating-point | None | FET Amplifier 19 Temperature (Celcius) |
| fet_amp_20_temp | 32-bit floating-point | None | FET Amplifier 20 Temperature (Celcius) |
| cal_temp_1 | 32-bit floating-point | None | Calibration Target 1 Temperature (Celcius) |
| cal_temp_2 | 32-bit floating-point | None | Calibration Target 2 Temperature (Celcius) |
| cal_temp_3 | 32-bit floating-point | None | Calibration Target 3 Temperature (Celcius) |

| | | | |
|---------------------------|-----------------------|-------------------|---|
| cal_temp_4 | 32-bit floating-point | None | Calibration Target 4 Temperature (Celcius) |
| cal_temp_5 | 32-bit floating-point | None | Calibration Target 5 Temperature (Celcius) |
| cal_temp_6 | 32-bit floating-point | None | Calibration Target 6 Temperature (Celcius) |
| cal_temp_7 | 32-bit floating-point | None | Calibration Target 7 Temperature (Celcius) |
| subrefl_temp | 32-bit floating-point | None | Subreflector Temperature (Celcius) |
| lom_17_curr | 32-bit floating-point | None | Local Oscillator Monitor Current 17 (Amps) |
| lom_181920_temp | 32-bit floating-point | None | Local Oscillator Monitor Temperature 18/19/20 (Amps) |
| lom_17_temp | 32-bit floating-point | None | Local Oscillator Monitor Temperature 17 (Celcius) |
| lom_181920_curr | 32-bit floating-point | None | Local Oscillator Monitor Current 18/19/20 (Celcius) |
| prt_bridge_volt | 32-bit floating-point | None | PRT Bridge Voltage (Volts) |
| prt_board_temp | 32-bit floating-point | None | PRT Board Temperature (Celcius) |
| psv_12vasec | 32-bit floating-point | None | Passive analog +12V (A) Secondary (Volts) |
| psv_m12vasec | 32-bit floating-point | None | Passive analog -12V (A) Secondary (Volts) |
| psv_15vasec | 32-bit floating-point | None | Passive analog +15V (A) Secondary (Volts) |
| psv_m15vasec | 32-bit floating-point | None | Passive analog -15V (A) Secondary (Volts) |
| psv_8vasec | 32-bit floating-point | None | Passive analog +8V (A) Secondary (Volts) |
| psv_5vasec | 32-bit floating-point | None | Passive analog +5V (A) Secondary (Volts) |
| psv_5vdsec | 32-bit floating-point | None | Passive analog +5V (D) Secondary (Volts) |
| psv_m5vasec | 32-bit floating-point | None | Passive analog -5V (A) Secondary (Volts) |
| psv_5vrefsec | 32-bit floating-point | None | Passive analog +5V Reference Secondary (Volts) |
| psv_ice_temp | 32-bit floating-point | None | ICE Temperature (Celcius) |
| psv_mde_temp | 32-bit floating-point | None | MDE Temperature (Celcius) |
| psv_peu_temp | 32-bit floating-point | None | PEU Temperature (Celcius) |
| psv_psu_temp | 32-bit floating-point | None | PSU Temperature (Celcius) |
| psv_scan_motor_temp | 32-bit floating-point | None | Scan Motor Temperature (Celcius) |
| psv_scan_motor_curr | 32-bit floating-point | None | Scan Motor Current (Amps) |
| psv_loc_osc_17_curr | 32-bit floating-point | None | Local Oscillator for Channel 17 (channel 2) current (Amps) |
| psv_loc_osc_181920_curr | 32-bit floating-point | None | Local Oscillator for Channels 18, 19, & 20 (channels 3, 4, & 5) current (Amps) |
| moonang | 32-bit floating-point | SpaceXTrack (= 4) | Angle (degrees) between the center of the moon and the boresight |
| spacecraft_state | 8-bit integer | None | Spacecraft state (0=LNCH; 1=STBY; 2=SCI; 3=SAFE; 4=SRVL; 5-7=UNDF) (set to -1 when not known) |
| spacecraft_xmtr_a_on | 8-bit integer | None | Spacecraft Transmitter A On/Off status (0=Off; 1=On; -1=Unknown) |
| spacecraft_xmtr_b_on | 8-bit integer | None | Spacecraft Transmitter B On/Off status (0=Off; 1=On; -1=Unknown) |
| spacecraft_modulator_a_on | 8-bit integer | None | Spacecraft Modulator A On/Off status (0=Off; 1=On; -1=Unknown) |

| | | | |
|---------------------------|-----------------------|------|--|
| spacecraft_modulator_b_on | 8-bit integer | None | Spacecraft Modulator B On/Off status (0=Off; 1=On; -1=Unknown) |
| spacecraft_xmtr_a_pwr | 32-bit floating-point | None | Spacecraft Transmitter A Power (DBW; -1=Unknown) |
| spacecraft_xmtr_b_pwr | 32-bit floating-point | None | Spacecraft Transmitter B Power (DBW; -1=Unknown) |

Size: 34965 bytes (0.0 MB) per 45-scanset granule

Full Swath Data Fields

These fields appear for every footprint of every scanline in the granule (GeoTrack * GeoXTrack times)

| Name | Type | Extra Dimensions | Explanation |
|--------------------|-------------------------|------------------|---|
| ftptgeoqa | 32-bit unsigned integer | None | Footprint Geolocation QA flags: bit 0 (LSB): bad input value; bit 1: PGS_TD_TAItoUTC() returned PGSTD_E_NO_LEAP_SECS; bit 2: PGS_TD_TAItoUTC() returned PGS_E_TOOLKIT; bit 3: PGS_CSC_GetFOV_Pixel() returned PGSCSC_W_MISS_EARTH; bit 4: PGS_CSC_GetFOV_Pixel() returned PGSTD_E_SC_TAG_UNKNOWN; bit 5: PGS_CSC_GetFOV_Pixel() returned PGSCSC_W_ZERO_PIXEL_VECTOR; bit 6: PGS_CSC_GetFOV_Pixel() returned PGSCSC_W_BAD_EPH_FOR_PIXEL; bit 7: PGS_CSC_GetFOV_Pixel() returned PGSCSC_W_INSTRUMENT_OFF_BOARD; bit 8: PGS_CSC_GetFOV_Pixel() returned PGSCSC_W_BAD_ACCURACY_FLAG; bit 9: PGS_CSC_GetFOV_Pixel() returned PGSCSC_E_BAD_ARRAY_SIZE; bit 10: PGS_CSC_GetFOV_Pixel() returned PGSCSC_W_DEFAULT_EARTH_MODEL; bit 11: PGS_CSC_GetFOV_Pixel() returned PGSCSC_W_DATA_FILE_MISSING; bit 12: PGS_CSC_GetFOV_Pixel() returned PGSCSC_E_NEG_OR_ZERO_RAD; bit 13: PGS_CSC_GetFOV_Pixel() returned PGSMEM_E_NO_MEMORY; bit 14: PGS_CSC_GetFOV_Pixel() returned PGSTD_E_NO_LEAP_SECS; bit 15: PGS_CSC_GetFOV_Pixel() returned PGSTD_E_TIME_FMT_ERROR; bit 16: PGS_CSC_GetFOV_Pixel() returned PGSTD_E_TIME_VALUE_ERROR; bit 17: PGS_CSC_GetFOV_Pixel() returned PGSCSC_W_PREDICTED_UT1; bit 18: PGS_CSC_GetFOV_Pixel() returned PGSTD_E_NO_UT1_VALUE; bit 19: PGS_CSC_GetFOV_Pixel() returned PGS_E_TOOLKIT; bit 20: PGS_CSC_GetFOV_Pixel() returned PGSEPH_E_BAD_EPHEM_FILE_HDR; bit 21: PGS_CSC_GetFOV_Pixel() returned PGSEPH_E_NO_SC_EPHEM_FILE; bit 22-31: not used |
| zengeoqa | 16-bit unsigned integer | None | Satellite zenith Geolocation QA flags: bit 0 (LSB): (Spacecraft) bad input value; bit 1: PGS_CSC_ZenithAzimuth(S/C) returned PGSCSC_W_BELOW_HORIZON; bit 2: PGS_CSC_ZenithAzimuth(S/C) returned PGSCSC_W_UNDEFINED_AZIMUTH; bit 3: PGS_CSC_ZenithAzimuth(S/C) returned PGSCSC_W_NO_REFRACTION; bit 4: PGS_CSC_ZenithAzimuth(S/C) returned PGSCSC_E_INVALID_VECTAG; bit 5: PGS_CSC_ZenithAzimuth(S/C) returned PGSCSC_E_LOOK_PT_ALIT_RANGE; bit 6: PGS_CSC_ZenithAzimuth(S/C) returned PGSCSC_E_ZERO_INPUT_VECTOR; bit 7: PGS_CSC_ZenithAzimuth(S/C) returned PGS_E_TOOLKIT; bit 8: (Sun) bad input value; bit 9: (suppressed) PGS_CSC_ZenithAzimuth(Sun) returned PGSCSC_W_BELOW_HORIZON (This is not an error condition - the sun is below the horizon at night); bit 10: PGS_CSC_ZenithAzimuth(Sun) returned PGSCSC_W_UNDEFINED_AZIMUTH; bit 11: PGS_CSC_ZenithAzimuth(Sun) returned PGSCSC_W_NO_REFRACTION; bit 12: PGS_CSC_ZenithAzimuth(Sun) returned PGSCSC_E_INVALID_VECTAG; bit 13: PGS_CSC_ZenithAzimuth(Sun) returned PGSCSC_E_LOOK_PT_ALIT_RANGE; bit 14: PGS_CSC_ZenithAzimuth(Sun) returned PGSCSC_E_ZERO_INPUT_VECTOR; bit 15: PGS_CSC_ZenithAzimuth(Sun) returned PGS_E_TOOLKIT |
| demgeoqa | 16-bit unsigned integer | None | Digital Elevation Model (DEM) Geolocation QA flags: bit 0 (LSB): bad input value; bit 1: Could not allocate memory; bit 2: Too close to North or South pole. Excluded; bit 3: Layer resolution incompatibility. Excluded; bit 4: Any DEM Routine (elev) returned PGSDDEM_E_IMPROPER_TAG; bit 5: Any DEM Routine (elev) returned PGSDDEM_E_CANNOT_ACCESS_DATA; bit 6: Any DEM Routine (land/water) returned PGSDDEM_E_IMPROPER_TAG; bit 7: Any DEM Routine (land/water) returned PGSDDEM_E_CANNOT_ACCESS_DATA; bit 8: Reserved for future layers; bit 9: Reserved for future layers; bit 10: PGS_DEM_GetRegion(elev) returned PGSDDEM_M_FILLVALUE_INCLUDED; bit 11: PGS_DEM_GetRegion(land/water) returned PGSDDEM_M_FILLVALUE_INCLUDED; bit 12: Reserved for future layers; bit 13: PGS_DEM_GetRegion(all) returned PGSDDEM_M_MULTIPLE_RESOLUTIONS; bit 14: PGS_CSC_GetFOV_Pixel() returned any 'W' class return code except PGSCSC_W_PREDICTED_UT1; bit 15: PGS_CSC_GetFOV_Pixel() returned any 'E' class return code |
| satzen | 32-bit floating-point | None | Spacecraft zenith angle (0.0 ... 180.0) degrees from zenith (measured relative to the geodetic vertical on the reference (WGS84) spheroid and including corrections outlined in EOS SDP toolkit for normal accuracy.) |
| satazi | 32-bit floating-point | None | Spacecraft azimuth angle (-180.0 ... 180.0) degrees E of N GEO) |
| solzen | 32-bit floating-point | None | Solar zenith angle (0.0 ... 180.0) degrees from zenith (measured relative to the geodetic vertical on the reference (WGS84) spheroid and including corrections outlined in EOS SDP toolkit for normal accuracy.) |
| solazi | 32-bit floating-point | None | Solar azimuth angle (-180.0 ... 180.0) degrees E of N GEO) |
| sun_glint_distance | 16-bit integer | None | Distance (km) from footprint center to location of the sun glint (-9999 for unknown, 30000 for no glint visible because spacecraft is in Earth's shadow) |
| topog | 32-bit floating-point | None | Mean topography in meters above reference ellipsoid |
| topog_err | 32-bit floating-point | None | Error estimate for topog |

| | | | |
|--------------|-------------------------|---------------|--|
| | point | | |
| landFrac | 32-bit floating-point | None | Fraction of spot that is land (0.0 ... 1.0) |
| landFrac_err | 32-bit floating-point | None | Error estimate for landFrac |
| scanang | 32-bit floating-point | None | Scanning angle of HSB instrument with respect to the HSB instrument for this footprint (-180.0 ... 180.0, negative at start of scan, 0 at nadir) |
| counts | 16-bit unsigned integer | Channel (= 5) | raw counts (data numbers) for each channel |

Size: 680400 bytes (0.7 MB) per 45-scanset granule

Calibration Swath Data Fields

These fields appear for every calibration footprint of every scanline in the granule (GeoTrack * CalXTrack times)

| Name | Type | Extra Dimensions | Explanation |
|-------------|-------------------------|------------------|---|
| cal_counts | 16-bit unsigned integer | Channel (= 5) | Raw counts (data numbers) for each channel |
| cal_tai | 64-bit floating-point | None | TAI time of calibration footprint (floating-point elapsed seconds since start of 1993) |
| cal_scanang | 32-bit floating-point | None | Scanning angle of HSB instrument for this calibration footprint (-180.0 ... 180.0, negative at start of scan, 0 at nadir) |

Size: 23760 bytes (0.0 MB) per 45-scanset granule

**Total File Size (plus storage for dimensions and other HDF-EOS overhead):
1030924 bytes (1.0 MB) per 45-scanset granule = 247.4 MB per day**

Special AIRS Types

HSB Packet Counts: This type tracks counts of packets received during an interval by conditions under which they were received

| Field Name | Type | Explanation |
|-------------------|----------------|---|
| missing_in | 16-bit integer | Count of packets missing between packets that are present |
| missing_ends | 16-bit integer | Count of packets missing at beginning or end of granule timespan: missing packets for which there are either no existing packets before them or no existing packets after them. (When all data is missing all packets will be counted here) |
| at_noop | 16-bit integer | Count of packets for which the spacecraft mode is not operational for some or all of the packet interval |
| illegal_mode | 16-bit integer | Count of packets for which there was an illegal instrument mode |
| special_cal | 16-bit integer | Count of packets for which the instrument was in a special calibration mode (parked in target view, parked in nadir view, parked in space view, investigation mode, or stepped mode) |
| invalid_data | 16-bit integer | Count of invalid packets (mode transitioning flag on, power off, all channels off, scan aborted, processor check failed, maybe pixel data invalid) |
| partially_invalid | 16-bit integer | Count of packets for which the data is partially invalid (channel 2 off or channels 3/4/5 off but not both off) |
| checksum_err | 16-bit integer | Count of packets with an error detected in the checksum |
| good | 16-bit integer | Count of packets not counted in any category above |
| bad_scan_sync | 16-bit integer | Count of packets for which Scan Sync error > 0.1 degrees |
| survival_heater | 16-bit integer | Count of packets for which Survival Heater is on |
| ROM_failed | 16-bit integer | Count of packets for which ROM check failed [TBD] |
| RAM_failed | 16-bit integer | Count of packets for which RAM check failed [TBD] |

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A1-8. L1B AIRS Science Interface Specification

Interface Specification Version 3.0.4.0
2003-05-19

ESDT ShortName = "AIRIBRAD"

Swath Name = "L1B_AIRS_Science"

Level = "level1B"

Footprints = 90

scanlines per scanset = 3

Dimensions

These fields define all dimensions that can be used for HDF-EOS swath fields.

The names "GeoTrack" and "GeoXTrack" have a special meaning for this document: "Cross-Track" data fields have a hidden dimension of "GeoXTrack"; "Along-Track" data fields have a hidden dimension of "GeoTrack"; "Full Swath Data Fields" have hidden dimensions of both "GeoTrack" and "GeoXTrack".

| Name | Value | Explanation |
|-------------------|--------------------------|---|
| GeoXTrack | 90 | Dimension across track for footprint positions. Same as number of footprints per scanline. -- starting at the left and increasing towards the right as you look along the satellite's path |
| GeoTrack | # of scan lines in swath | Dimension along track for footprint positions. Same as number of scanlines in granule. Parallel to the satellite's path, increasing with time. (Nominally 45 for Level-2, AMSU-A, and AIRS/Vis low-rate engineering; 135 for AIRS/Vis and HSB high-rate quantities) |
| CalXTrack | 6 | Dimension "across" track for calibration footprint positions. Same as number of calibration footprints per scanline. (NUM_FOOTPRINTS_AIRS_CALIB) (Footprints are ordered: 1-4: spaceviews (ports 3, 4, 1, 2); 5: blackbody radiometric calibration source; 6: spectral/photometric calibration sources) |
| SpaceXTrack | 4 | Dimension "across" track for spaceview calibration footprint positions in order of observation time. (NUM_FOOTPRINTS_AIRS_SPACE) |
| BBXTrack | 1 | Dimension "across" track for blackbody calibration footprint positions in order of observation time. (NUM_FOOTPRINTS_AIRS_BB) |
| Channel | 2378 | Dimension of channel array (Channels are generally in order of increasing wavenumber, but because frequencies can vary and because all detectors from a physical array of detector elements (a "module") are always grouped together there are sometimes small reversals in frequency order where modules overlap.) |
| MaxRefChannel | 100 | Maximum number of radiometric reference channels. "RefChannels" lists the channels used. |
| MaxFeaturesUpwell | 35 | Maximum number of spectral features in upwelling radiances used for spectral calibration |
| MaxFeaturesPary | 17 | Maximum number of spectral features in parylene radiances used for spectral calibration |

Geolocation Fields

These fields appear for every footprint (GeoTrack * GeoXTrack times) and correspond to footprint center coordinates and "shutter" time.

| Name | Explanation |
|-----------|--|
| Latitude | Footprint boresight geodetic Latitude in degrees North (-90.0 ... 90.0) |
| Longitude | Footprint boresight geodetic Longitude in degrees East (-180.0 ... 180.0) |
| Time | Footprint "shutter" TAI Time: floating-point elapsed seconds since Jan 1, 1993 |

Size: 291600 bytes (0.3 MB) per 45-scanset granule

Attributes

These fields appear only once per granule

| Name | Type | Extra Dimensions | Explanation |
|------------------|----------------------------|------------------|---|
| processing_level | string of 8-bit characters | None | Zero-terminated character string denoting processing level ("level1B") |
| instrument | string of 8-bit characters | None | Zero-terminated character string denoting instrument ("AIRS") |
| DayNightFlag | string of 8-bit characters | None | Zero-terminated character string denoting granule as day and/or night: (Always "Day", "Night", or "Both") |
| AutomaticQAFlag | string of 8-bit characters | None | Zero-terminated character string denoting granule data quality: (Always "Passed", "Failed", or "Suspect") |
| NumTotalData | 32-bit integer | None | Total number of expected scene footprints |

| | | | |
|-----------------|----------------------------|------|--|
| NumProcessData | 32-bit integer | None | Number of scene footprints which are present and can be processed routinely (state = 0) |
| NumSpecialData | 32-bit integer | None | Number of scene footprints which are present and can be processed only as a special test (state = 1) |
| NumBadData | 32-bit integer | None | Number of scene footprints which are present but cannot be processed (state = 2) |
| NumMissingData | 32-bit integer | None | Number of expected scene footprints which are not present (state = 3) |
| NumLandSurface | 32-bit integer | None | Number of scene footprints for which the surface is more than 90% land |
| NumOceanSurface | 32-bit integer | None | Number of scene footprints for which the surface is less than 10% land |
| node_type | string of 8-bit characters | None | Zero-terminated character string denoting whether granule is ascending, descending, or pole-crossing: ("Ascending" and "Descending" for entirely ascending or entirely descending granules, or "NorthPole" or "SouthPole" for pole-crossing granules) |
| start_year | 32-bit integer | None | Year in which granule started, UTC (e.g. 1999) |
| start_month | 32-bit integer | None | Month in which granule started, UTC (1 ... 12) |
| start_day | 32-bit integer | None | Day of month in which granule started, UTC (1 ... 31) |
| start_hour | 32-bit integer | None | Hour of day in which granule started, UTC (0 ... 23) |
| start_minute | 32-bit integer | None | Minute of hour in which granule started, UTC (0 ... 59) |
| start_sec | 32-bit floating-point | None | Second of minute in which granule started, UTC (0.0 ... 59.0) |
| start_orbit | 32-bit integer | None | Orbit number of mission in which granule started |
| end_orbit | 32-bit integer | None | Orbit number of mission in which granule ended |
| orbit_path | 32-bit integer | None | Orbit path of start orbit (1 ... 233 as defined by EOS project) |
| start_orbit_row | 32-bit integer | None | Orbit row at start of granule (1 ... 248 as defined by EOS project) |
| end_orbit_row | 32-bit integer | None | Orbit row at end of granule (1 ... 248 as defined by EOS project) |
| granule_number | 32-bit integer | None | Number of granule within day (1 ... 240) |
| num_scansets | 32-bit integer | None | Number of scansets in granule (1 ... 45) |
| num_scanlines | 32-bit integer | None | Number of scanlines in granule (3 * num_scansets) |
| start_Latitude | 64-bit floating-point | None | Geodetic Latitude of spacecraft at start of granule in degrees North (-90.0 ... 90.0) |
| start_Longitude | 64-bit floating-point | None | Geodetic Longitude of spacecraft at start of granule in degrees East (-180.0 ... 180.0) |
| start_Time | 64-bit floating-point | None | TAI Time at start of granule (floating-point elapsed seconds since start of 1993) |
| end_Latitude | 64-bit floating-point | None | Geodetic Latitude of spacecraft at end of granule in degrees North (-90.0 ... 90.0) |
| end_Longitude | 64-bit floating-point | None | Geodetic Longitude of spacecraft at end of granule in degrees East (-180.0 ... 180.0) |
| end_Time | 64-bit floating-point | None | TAI Time at end of granule (floating-point elapsed seconds since start of 1993) |
| eq_x_longitude | 32-bit floating-point | None | Longitude of spacecraft at southward equator crossing nearest granule start in degrees East (-180.0 ... 180.0) |
| eq_x_tai | 64-bit floating-point | None | Time of eq_x_longitude in TAI units (floating-point elapsed seconds since start of 1993) |
| orbitgeoqa | 32-bit unsigned integer | None | Orbit Geolocation QA: bit 0 (LSB): bad input value (last scanline); bit 1: bad input value (first scanline); bit 2: PGS_EPH_GetEphMet() returned PGSEPH_E_NO_SC_EPHEM_FILE; bit 3: PGS_EPH_GetEphMet() returned PGSEPH_E_BAD_ARRAY_SIZE; bit 4: PGS_EPH_GetEphMet() returned PGSTD_E_TIME_FMT_ERROR; bit 5: PGS_EPH_GetEphMet() returned PGSTD_E_TIME_VALUE_ERROR; bit 6: PGS_EPH_GetEphMet() returned PGSTD_E_SC_TAG_UNKNOWN; bit 7: PGS_EPH_GetEphMet() returned PGS_E_TOOLKIT; bit 8: PGS_TD_UTCtoTAI() returned PGSTD_E_NO_LEAP_SECS; bit 9: PGS_TD_UTCtoTAI() returned PGSTD_E_TIME_FMT_ERROR; bit 10: PGS_TD_UTCtoTAI() returned PGSTD_E_TIME_VALUE_ERROR; bit 11: PGS_TD_UTCtoTAI() returned PGS_E_TOOLKIT; bit 12: PGS_CSC_DayNight() returned PGSTD_E_NO_LEAP_SECS; bit 13: PGS_CSC_DayNight() returned PGSCSC_E_INVALID_LIMITTAG; bit 14: PGS_CSC_DayNight() returned PGSCSC_E_BAD_ARRAY_SIZE; bit 15: PGS_CSC_DayNight() returned PGSCSC_W_ERROR_IN_DAYNIGHT; bit 16: PGS_CSC_DayNight() returned PGSCSC_W_BAD_TRANSFORM_VALUE; bit 17: PGS_CSC_DayNight() returned PGSCSC_W_BELOW_HORIZON; bit 18: PGS_CSC_DayNight() returned PGSCSC_W_PREDICTED_UT1; bit 19: PGS_CSC_DayNight() returned PGSTD_E_NO_UT1_VALUE; bit 20: PGS_CSC_DayNight() returned PGSTD_E_BAD_INITIAL_TIME; bit 21: PGS_CSC_DayNight() returned PGSCRP_E_TIME_OUT_OF_RANGE; bit |

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|---------------------|--|--------------------------------------|---|
| | | | 22: PGS_CSC_DayNight() returned PGSCBP_E_UNABLE_TO_OPEN_FILE; bit 22: PGS_CSC_DayNight() returned PGSMEM_E_NO_MEMORY; bit 24: PGS_CSC_DayNight() returned PGS_E_TOOLKIT; bit 25-31: not used |
| num_satgeoqa | 16-bit integer | None | Number of scans with problems in satgeoqa |
| num_glintgeoqa | 16-bit integer | None | Number of scans with problems in glintgeoqa |
| num_moongoqa | 16-bit integer | None | Number of scans with problems in moongoqa |
| num_ftptgeoqa | 16-bit integer | None | Number of footprints with problems in ftptgeoqa |
| num_zengeoqa | 16-bit integer | None | Number of footprints with problems in zengeoqa |
| num_demgeoqa | 16-bit integer | None | Number of footprints with problems in demgeoqa |
| num_fpe | 16-bit integer | None | Number of floating point errors |
| LonGranuleCen | 16-bit integer | None | Geodetic Longitude of the center of the granule in degrees East (-180 ... 180) |
| LatGranuleCen | 16-bit integer | None | Geodetic Latitude of the center of the granule in degrees North (-90 ... 90) |
| LocTimeGranuleCen | 16-bit integer | None | Local solar time at the center of the granule in minutes past midnight (0 ... 1439) |
| CalGranSummary | 8-bit unsigned integer | None | Bit field. Bitwise OR of CalChanSummary, over all good channels (see ExcludedChans). Zero means all good channels were well calibrated, for all scanlines. bit 7 (MSB): scene over/underflow; bit 6: anomaly in offset calculation; bit 5: anomaly in gain calculation; bit 4: pop detected; bit 3: noise out of bounds; bit 2: anomaly in spectral calibration; bit 1: Telemetry; bit 0: unused (reserved); |
| CalChanSummary | 8-bit unsigned integer | Channel (= 2378) | Bit field. Bitwise OR of CalFlag, by channel, over all scanlines. Noise threshold and spectral quality added. Zero means the channel was well calibrated for all scanlines bit 7 (MSB): scene over/underflow; bit 6: anomaly in offset calculation; bit 5: anomaly in gain calculation; bit 4: pop detected; bit 3: noise out of bounds; bit 2: anomaly in spectral calibration; bit 1: Telemetry; bit 0: unused (reserved); |
| ExcludedChans | 8-bit unsigned integer | Channel (= 2378) | An integer 0-6, indicating A/B detector weights. Used in L1B processing. 0 - A weight = B weight. Probably better than channels with state > 2; 1 - A-side only. Probably better than channels with state > 2; 2 - B-side only. Probably better than channels with state > 2; 3 - A weight = B weight. Probably better than channels with state = 6; 4 - A-side only. Probably better than channels with state = 6; 5 - B-side only. Probably better than channels with state = 6; 6 - A weight = B weight. |
| NeN | 32-bit floating-point | Channel (= 2378) | Noise-equivalent Radiance (radiance units) for an assumed 250K scene |
| DCR_scan | 16-bit integer | None | Scanline number of (first) DC-Restore. 0 for no DC-Restore |
| input_scene_counts | Limited Engineering Struct (see below) | Channel (= 2378) | Input statistics on scene data numbers |
| input_space_counts | Limited Engineering Struct (see below) | SpaceXTrack (= 4) * Channel (= 2378) | Input statistics on spaceview data numbers |
| input_space_signals | Limited Engineering Struct (see below) | SpaceXTrack (= 4) * Channel (= 2378) | Input statistics on spaceview signals (data numbers with offset subtracted) |
| input_space_diffs | Unlimited Engineering Struct (see below) | SpaceXTrack (= 4) * Channel (= 2378) | Statistics on differences between corresponding space views, for consecutive scanlines |
| input_bb_counts | Limited Engineering Struct (see below) | Channel (= 2378) | Input statistics on blackbody calibration data numbers |
| input_bb_signals | Limited Engineering Struct (see below) | Channel (= 2378) | Input statistics on blackbody calibration signals (data numbers with offset subtracted) |
| input_spec_counts | Limited Engineering Struct (see below) | Channel (= 2378) | Input statistics on spectral calibration data numbers |
| input_bb_temp | Limited Engineering Struct (see below) | None | Input statistics on Blackbody temperature |

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|-------------------------|--|--|--|
| input_bb_temp1 | Limited Engineering Struct (see below) | None | Input statistics on Blackbody temperature 1A (CaBbTempV1A or CaBbTempV1B, as active) |
| input_bb_temp2 | Limited Engineering Struct (see below) | None | Input statistics on Blackbody temperature 2 (CaBbTempV2A or CaBbTempV2B, as active) |
| input_bb_temp3 | Limited Engineering Struct (see below) | None | Input statistics on Blackbody temperature 3 (CaBbTemp3, active A or B) |
| input_bb_temp4 | Limited Engineering Struct (see below) | None | Input statistics on Blackbody temperature4 (CaBbTemp4, active A or B) |
| input_spec_temp | Limited Engineering Struct (see below) | None | Input statistics on Spectrometer temperature |
| input_ir_det_temp | Limited Engineering Struct (see below) | None | Input statistics on IR detector temperature |
| input_grating_temp_1 | Limited Engineering Struct (see below) | None | Input statistics on Grating temperature 1 (SpGratngTemp1, active A or B) |
| input_grating_temp_2 | Limited Engineering Struct (see below) | None | Input statistics on Grating temperature 2 (SpGratngTemp2, active A or B) |
| input_entr_filt_temp | Limited Engineering Struct (see below) | None | Input statistics on the entrance filter temperature (SpEntFiltTmp, active A or B) |
| input_opt_bench_temp_2 | Limited Engineering Struct (see below) | None | Input statistics on optical bench temperature 2 (SpOptBnchTmp2, active A or B) |
| input_opt_bench_temp_3 | Limited Engineering Struct (see below) | None | Input statistics on optical bench temperature 3 (SpOptBnchTmp3, active A or B) |
| input_scan_mirror_temp | Limited Engineering Struct (see below) | None | Input statistics on scan mirror housing temperature |
| input_chopper_phase_err | Limited Engineering Struct (see below) | None | Input statistics on chopper phase error voltage (ChPhaseErrVA or ChPhaseErrVB, as active) |
| PopCount | 32-bit integer | None | Number of popcorn events within granule, i.e. number of times than an AIRS channel used in the Level 2 retrieval has suffered a sudden discontinuity in dark current |
| offset_stats | Unlimited Engineering Struct (see below) | Channel (= 2378) | Statistics on offsets |
| gain_stats | Unlimited Engineering Struct (see below) | Channel (= 2378) | Statistics on gains |
| rad_stats | Unlimited Engineering Struct (see below) | Channel (= 2378) | Statistics on radiances (radiance units) |
| NumRefChannels | 32-bit integer | None | The number of channels reported in MaxRefChannel arrays |
| RefChannels | 32-bit integer | MaxRefChannel (= 100) | The 1-based indexes of channels reported in MaxRefChannel arrays |
| rad_scan_stats | Unlimited Engineering Struct (see below) | GeoXTrack (= 90) * MaxRefChannel (= 100) | Statistics on scan angle dependence of radiances |

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|-----------------------------|--|--------------------------|---|
| Rdiff_swindow_M1a_chan | 16-bit integer | None | Array M1a channel used as one reference in calculating Rdiff_swindow. (index into radiance & frequency arrays 1...2378) |
| Rdiff_swindow_M2a_chan | 16-bit integer | None | Array M2a channel used as one reference in calculating Rdiff_swindow. (index into radiance & frequency arrays 1...2378) |
| Rdiff_lwindow_M8_chan | 16-bit integer | None | Array M8 channel used as one reference in calculating Rdiff_lwindow. (index into radiance & frequency arrays 1...2378) |
| Rdiff_lwindow_M9_chan | 16-bit integer | None | Array M9 channel used as one reference in calculating Rdiff_lwindow. (index into radiance & frequency arrays 1...2378) |
| Rdiff_strat_M2b_chan | 16-bit integer | None | Array M2b channel used as one reference in calculating Rdiff_strat. (index into radiance & frequency arrays 1...2378) |
| Rdiff_strat_M1b_chan | 16-bit integer | None | Array M1b channel used as one reference in calculating Rdiff_strat. (index into radiance & frequency arrays 1...2378) |
| granules_present | string of 8-bit characters | None | Zero-terminated character string denoting which adjacent granules were available for smoothing ("All" for both previous & next, "Prev" for previous but not next, "Next" for next but not previous, "None" for neither previous nor next) |
| spectral_TAI | 64-bit floating-point | None | TAI time of (first) Spectral calibration. (floating-point elapsed seconds since start of 1993) 0 for no Spectral calibration occurred in this granule. |
| nominal_freq | 32-bit floating-point | Channel (= 2378) | Nominal frequencies (in cm ⁻¹) of each channel |
| spectral_freq | 32-bit floating-point | Channel (= 2378) | Calculated frequencies (in cm ⁻¹) |
| spectral_freq_unc | 32-bit floating-point | Channel (= 2378) | Uncertainty in calculated frequencies (in cm ⁻¹) |
| spec_shift_upwell | 32-bit floating-point | None | Focal plane shift calculated in grating model fit to upwelling radiances (microns) |
| spec_shift_unc_upwell | 32-bit floating-point | None | Uncertainty of the focal plane shift calculated in the grating model fit to upwelling radiances (microns) |
| spec_fl_upwell | 32-bit floating-point | None | Focal length calculated in grating model fit to upwelling radiances (microns) |
| spec_fl_unc_upwell | 32-bit floating-point | None | Uncertainty of focal length calculated in grating model fit to upwelling radiances (microns) |
| SpectralFeaturesUpwell | 32-bit integer | None | The actual number of upwelling features for MaxFeaturesUpwell-sized arrays |
| spec_feature_shifts_upwell | 32-bit floating-point | MaxFeaturesUpwell (= 35) | Spectral shift seen for each upwelling feature, in microns at the focal plane |
| spec_feature_corr_upwell | 32-bit floating-point | MaxFeaturesUpwell (= 35) | Maximum correlation seen for each upwelling feature (0.0 ... 1.0) |
| spec_feature_sharp_upwell | 32-bit floating-point | MaxFeaturesUpwell (= 35) | Quadratic coefficient in fit to correlation for each upwelling feature |
| spec_feature_resid_upwell | 32-bit floating-point | MaxFeaturesUpwell (= 35) | Fit residual for each upwelling feature (wavenumbers) |
| spec_iter_upwell | 16-bit integer | None | Number of amoeba iterations to fit the grating model to upwelling radiance feature positions |
| spec_feature_contrast_stats | Limited Engineering Struct (see below) | MaxFeaturesUpwell (= 35) | Statistics on the spectral contrasts for each of the upwelling features, for each of the scene footprints considered for spectral calibration |
| spec_clim_select | 16-bit integer | None | Number of the climatology to which the upwelling features were fitted |
| spec_shift_pary | 32-bit floating-point | None | Focal plane shift calculated in grating model fit to parylene radiances (microns) |
| spec_shift_unc_pary | 32-bit floating-point | None | Uncertainty of the focal plane shift calculated in grating model fit to parylene radiances (microns) |
| spec_fl_pary | 32-bit floating-point | None | Focal length calculated in grating model fit to parylene radiances (microns) |
| spec_fl_unc_pary | 32-bit floating-point | None | Uncertainty of focal length calculated in grating model fit to parylene radiances (microns) |
| SpectralFeaturesPary | 32-bit integer | None | The actual number of parylene features for MaxFeaturesPary-sized arrays |
| spec_feature_shifts_pary | 32-bit floating-point | MaxFeaturesPary (= 17) | Spectral shift seen for each parylene feature, in microns at the focal plane |
| spec_feature_corr_pary | 32-bit floating-point | MaxFeaturesPary (= 17) | Maximum correlation seen for each parylene feature (0.0 ... 1.0) |
| spec_feature_sharp_pary | 32-bit floating-point | MaxFeaturesPary (= 17) | Quadratic coefficient in fit to correlation for each parylene feature |

| | | | |
|-------------------------|-----------------------|------------------------|---|
| spec_feature_resid_pary | 32-bit floating-point | MaxFeaturesPary (= 17) | Fit residual for each parylene feature (wavenumbers) |
| spec_iter_pary | 16-bit integer | None | Number of amoeba iterations in fit the grating model to parylene radiance feature positions |
| ave_pary_spectrum | 32-bit floating-point | Channel (= 2378) | The average parylene spectrum (over good scanlines), in milliWatts/m**2/cm**-1/steradian |
| DCRCOUNT | 32-bit integer | None | Number of times a Direct Current Restore was executed for any module |

Size: 3776779 bytes (3.8 MB) per granule

Along-Track Data Fields

These fields appear once per scanline (GeoTrack times)

| Name | Type | Extra Dimensions | Explanation |
|------------|-------------------------|------------------|--|
| satheight | 32-bit floating-point | None | Satellite altitude at nadirTAI in km above reference ellipsoid (e.g. 725.2) |
| satroll | 32-bit floating-point | None | Satellite attitude roll angle at nadirTAI (-180.0 ... 180.0 angle about the +x (roll) ORB axis, +x axis is positively oriented in the direction of orbital flight completing an orthogonal triad with y and z.) |
| satpitch | 32-bit floating-point | None | Satellite attitude pitch angle at nadirTAI (-180.0 ... 180.0 angle about +y (pitch) ORB axis, +y axis is oriented normal to the orbit plane with the positive sense opposite to that of the orbit's angular momentum vector H.) |
| satyaw | 32-bit floating-point | None | Satellite attitude yaw angle at nadirTAI (-180.0 ... 180.0 angle about +z (yaw) axis, +z axis is positively oriented earthward parallel to the satellite radius vector R from the spacecraft center of mass to the center of the Earth.) |
| satgeoqa | 32-bit unsigned integer | None | Satellite Geolocation QA flags: bit 0 (LSB): bad input value; bit 1: PGS_TD_TAItUTC() returned PGSTD_E_NO_LEAP_SECS; bit 2: PGS_TD_TAItUTC() returned PGS_E_TOOLKIT; bit 3: PGS_EPH_EphemAttit() returned PGSEPH_W_BAD_EPHEM_VALUE; bit 4: PGS_EPH_EphemAttit() returned PGSEPH_E_BAD_EPHEM_FILE_HDR; bit 5: PGS_EPH_EphemAttit() returned PGSEPH_E_NO_SC_EPHEM_FILE; bit 6: PGS_EPH_EphemAttit() returned PGSEPH_E_NO_DATA_REQUESTED; bit 7: PGS_EPH_EphemAttit() returned PGSTD_E_SC_TAG_UNKNOWN; bit 8: PGS_EPH_EphemAttit() returned PGSEPH_E_BAD_ARRAY_SIZE; bit 9: PGS_EPH_EphemAttit() returned PGSTD_E_TIME_FMT_ERROR; bit 10: PGS_EPH_EphemAttit() returned PGSTD_E_TIME_VALUE_ERROR; bit 11: PGS_EPH_EphemAttit() returned PGSTD_E_NO_LEAP_SECS; bit 12: PGS_EPH_EphemAttit() returned PGS_E_TOOLKIT; bit 13: PGS_CSC_ECIttoECR() returned PGSCSC_W_BAD_TRANSFORM_VALUE; bit 14: PGS_CSC_ECIttoECR() returned PGSCSC_E_BAD_ARRAY_SIZE; bit 15: PGS_CSC_ECIttoECR() returned PGSTD_E_NO_LEAP_SECS; bit 16: PGS_CSC_ECIttoECR() returned PGSTD_E_TIME_FMT_ERROR; bit 17: PGS_CSC_ECIttoECR() returned PGSTD_E_TIME_VALUE_ERROR; bit 18: unused (set to zero); bit 19: PGS_CSC_ECIttoECR() returned PGSTD_E_NO_UT1_VALUE; bit 20: PGS_CSC_ECIttoECR() returned PGS_E_TOOLKIT; bit 21: PGS_CSC_ECRtoGEO() returned PGSCSC_W_TOO_MANY_ITERS; bit 22: PGS_CSC_ECRtoGEO() returned PGSCSC_W_INVALID_ALTITUDE; bit 23: PGS_CSC_ECRtoGEO() returned PGSCSC_W_SPHERE_BODY; bit 24: PGS_CSC_ECRtoGEO() returned PGSCSC_W_LARGE_FLATTENING; bit 25: PGS_CSC_ECRtoGEO() returned PGSCSC_W_DEFAULT_EARTH_MODEL; bit 26: PGS_CSC_ECRtoGEO() returned PGSCSC_E_BAD_EARTH_MODEL; bit 27: PGS_CSC_ECRtoGEO() returned PGS_E_TOOLKIT; bit 28-31: not used |
| glintgeoqa | 16-bit unsigned integer | None | Glint Geolocation QA flags: bit 0 (LSB): bad input value; bit 1: glint location in Earth's shadow; bit 2: glint calculation not converging; bit 3: glint location sun vs. satellite zenith mismatch; bit 4: glint location sun vs. satellite azimuth mismatch; bit 5: bad glint location; bit 6: PGS_CSC_ZenithAzimuth() returned any 'W' class return code; bit 7: PGS_CSC_ZenithAzimuth() returned any 'E' class return code; bit 8: PGS_CBP_Earth_CB_Vector() returned returned any 'W' class return code; bit 9: PGS_CBP_Earth_CB_Vector() returned returned any 'E' class return code; bit 10: PGS_CSC_ECIttoECR() returned any 'W' class return code except PGSCSC_W_PREDICTED_UT1 (for Glint); bit 11: PGS_CSC_ECIttoECR() returned any 'E' class return code (for Glint); bit 12: PGS_CSC_ECRtoGEO() returned any 'W' class return code (for Glint); bit 13: PGS_CSC_ECRtoGEO() returned any 'E' class return code (for Glint); bit 14: PGS_CSC_ECIttoECR() returned any 'W' class return code except PGSCSC_W_PREDICTED_UT1; bit 15: PGS_CSC_ECIttoECR() returned any 'E' class return code |
| moongeoa | 16-bit unsigned integer | None | Moon Geolocation QA flags: bit 0 (LSB): bad input value; bit 1: PGS_TD_TAItUTC() returned PGSTD_E_NO_LEAP_SECS; bit 2: PGS_TD_TAItUTC() returned PGS_E_TOOLKIT; bit 3: PGS_CBP_Sat_CB_Vector() returned PGSCSC_W_BELOW_SURFACE; bit 4: PGS_CBP_Sat_CB_Vector() returned PGSCBP_W_BAD_CB_VECTOR; bit 5: PGS_CBP_Sat_CB_Vector() returned PGSCBP_E_BAD_ARRAY_SIZE; bit 6: PGS_CBP_Sat_CB_Vector() returned PGSCBP_E_INVALID_CB_ID; bit 7: PGS_CBP_Sat_CB_Vector() returned PGSMEM_E_NO_MEMORY; bit 8: PGS_CBP_Sat_CB_Vector() returned PGSCBP_E_UNABLE_TO_OPEN_FILE; bit 9: PGS_CBP_Sat_CB_Vector() returned PGSTD_E_BAD_INITIAL_TIME; bit 10: PGS_CBP_Sat_CB_Vector() returned PGSCBP_E_TIME_OUT_OF_RANGE; bit 11: PGS_CBP_Sat_CB_Vector() returned PGSCBP_E_SC_TAG_UNKNOWN; bit 12: PGS_CBP_Sat_CB_Vector() returned PGSEPH_E_BAD_EPHEM_FILE_HDR; bit 13: PGS_CBP_Sat_CB_Vector() returned PGSEPH_E_NO_SC_EPHEM_FILE; bit 14: PGS_CBP_Sat_CB_Vector() returned |

| | | | |
|---------------------|-------------------------|-----------------------|--|
| | | | PGS_E_TOOLKIT; bit 15: not used |
| nadirTAI | 64-bit floating-point | None | TAI time at which instrument is nominally looking directly down. (between footprints 15 & 16 for AMSU or between footprints 45 & 46 for AIRS/Vis & HSB) (floating-point elapsed seconds since start of 1993) |
| sat_lat | 64-bit floating-point | None | Satellite geodetic latitude in degrees North (-90.0 ... 90.0) |
| sat_lon | 64-bit floating-point | None | Satellite geodetic longitude in degrees East (-180.0 ... 180.0) |
| scan_node_type | 8-bit integer | None | 'A' for ascending, 'D' for descending, 'N' for North-Polar, 'S' for South-Polar |
| glintlat | 32-bit floating-point | None | Solar glint geodetic latitude in degrees North at nadirTAI (-90.0 ... 90.0) |
| glintlon | 32-bit floating-point | None | Solar glint geodetic longitude in degrees East at nadirTAI (-180.0 ... 180.0) |
| CalScanSummary | 8-bit unsigned integer | None | Bit field. Bitwise OR of CalFlag over the good channel list (see ExcludedChans). Zero means all "good" channels were well calibrated for this scanline bit 7 (MSB): scene over/underflow; bit 6: anomaly in offset calculation; bit 5: anomaly in gain calculation; bit 4: pop detected; bit 3: DCR Occurred; bit 2: Moon in View; bit 1: telemetry out of limit condition; bit 0: unused (reserved) |
| CalFlag | 8-bit unsigned integer | Channel (= 2378) | Bit field, by channel, for the current scanline. Zero means the channel was well calibrated, for this scanline. bit 7 (MSB): scene over/underflow; bit 6: anomaly in offset calculation; bit 5: anomaly in gain calculation; bit 4: pop detected; bit 3: DCR Occurred; bit 2: Moon in View; bit 1: telemetry out of limit condition; bit 0: unused (reserved) |
| SpaceViewDelta | 32-bit floating-point | Channel (= 2378) | The mean of the four spaceviews immediately following the Earth views in the scanline, minus the mean of the spaceviews immediately preceding the Earth views in the scanline (also the magnitude of a "pop" in this scanline, when the "pop detected" bit is set in CalFlag.) (data numbers) |
| spaceview_selection | 8-bit unsigned integer | None | Indicates which footprints were included for this scan. Each bit is high when the corresponding space view is used in the spaceview offset calculation. (See L1B Processing Requirements, section 6.2); LSB is first space view. |
| gain | 32-bit floating-point | MaxRefChannel (= 100) | Gain: number of radiance units per count |
| OpMode | 16-bit unsigned integer | None | Instrument Operations Mode. See AIRS Command Handbook, section 6.4 for a definition of each bit. bits 0 (LSB)-2 cal phase; bits 3-6 Cal Func; bit 7 quicklook (expedited) flag; bits 8-11 submode bits 12-14 Mode (0=standby, 1=ready, 2=operate, 3=checkout, 4=decontaminate, 5=off, 6=survival); bit 16 transition flag |
| DpCircCount | 16-bit unsigned integer | None | Data Processing circumvention counts (active A or B) (counts) |
| DpCircBasThr | 16-bit unsigned integer | None | Data Processing circumvention base threshold (active A or B) |

Size: 1667925 bytes (1.7 MB) per 45-scanset granule

Full Swath Data Fields

These fields appear for every footprint of every scanline in the granule (GeoTrack * GeoXTrack times)

| Name | Type | Extra Dimensions | Explanation |
|-----------|-------------------------|------------------|---|
| radiances | 32-bit floating-point | Channel (= 2378) | Radiances for each channel in milliWatts/m**2/cm**-1/steradian |
| scanang | 32-bit floating-point | None | Scanning angle of AIRS instrument with respect to the AIRS Instrument for this footprint (-180.0 ... 180.0, negative at start of scan, 0 at nadir) |
| ftptgeoqa | 32-bit unsigned integer | None | Footprint Geolocation QA flags: bit 0 (LSB): bad input value; bit 1: PGS_TD_TAItUTC() returned PGSTD_E_NO_LEAP_SECS; bit 2: PGS_TD_TAItUTC() returned PGS_E_TOOLKIT; bit 3: PGS_CSC_GetFOV_Pixel() returned PGSCSC_W_MISS_EARTH; bit 4: PGS_CSC_GetFOV_Pixel() returned PGSTD_E_SC_TAG_UNKNOWN; bit 5: PGS_CSC_GetFOV_Pixel() returned PGSCSC_W_ZERO_PIXEL_VECTOR; bit 6: PGS_CSC_GetFOV_Pixel() returned PGSCSC_W_BAD_EPH_FOR_PIXEL; bit 7: PGS_CSC_GetFOV_Pixel() returned PGSCSC_W_INSTRUMENT_OFF_BOARD; bit 8: PGS_CSC_GetFOV_Pixel() returned PGSCSC_W_BAD_ACCURACY_FLAG; bit 9: PGS_CSC_GetFOV_Pixel() returned PGSCSC_E_BAD_ARRAY_SIZE; bit 10: PGS_CSC_GetFOV_Pixel() returned PGSCSC_W_DEFAULT_EARTH_MODEL; bit 11: PGS_CSC_GetFOV_Pixel() returned PGSCSC_W_DATA_FILE_MISSING; bit 12: PGS_CSC_GetFOV_Pixel() returned PGSCSC_E_NEG_OR_ZERO_RAD; bit 13: PGS_CSC_GetFOV_Pixel() returned PGSMEM_E_NO_MEMORY; bit 14: PGS_CSC_GetFOV_Pixel() returned PGSTD_E_NO_LEAP_SECS; bit 15: PGS_CSC_GetFOV_Pixel() returned PGSTD_E_TIME_FMT_ERROR; bit 16: PGS_CSC_GetFOV_Pixel() returned PGSTD_E_TIME_VALUE_ERROR; bit 17: PGS_CSC_GetFOV_Pixel() returned PGSCSC_W_PREDICTED_UT1; bit 18: PGS_CSC_GetFOV_Pixel() returned PGSTD_E_NO_UT1_VALUE; bit 19: PGS_CSC_GetFOV_Pixel() returned PGS_E_TOOLKIT; bit 20: PGS_CSC_GetFOV_Pixel() returned PGSEPH_E_BAD_EPHEM_FILE_HDR; bit 21: PGS_CSC_GetFOV_Pixel() returned PGSEPH_E_NO_SC_EPHEM_FILE; bit 22-31: not used |

| | | | |
|--------------------|-------------------------|------|--|
| zengeoqa | 16-bit unsigned integer | None | Satellite zenith Geolocation QA flags: bit 0 (LSB): (Spacecraft) bad input value; bit 1: PGS_CSC_ZenithAzimuth(S/C) returned PGSCSC_W_BELOW_HORIZON; bit 2: PGS_CSC_ZenithAzimuth(S/C) returned PGSCSC_W_UNDEFINED_AZIMUTH; bit 3: PGS_CSC_ZenithAzimuth(S/C) returned PGSCSC_W_NO_REFRACTION; bit 4: PGS_CSC_ZenithAzimuth(S/C) returned PGSCSC_E_INVALID_VECTAG; bit 5: PGS_CSC_ZenithAzimuth(S/C) returned PGSCSC_E_LOOK_PT_ALTIT_RANGE; bit 6: PGS_CSC_ZenithAzimuth(S/C) returned PGSCSC_E_ZERO_INPUT_VECTOR; bit 7: PGS_CSC_ZenithAzimuth(S/C) returned PGS_E_TOOLKIT; bit 8: (Sun) bad input value; bit 9: (suppressed) PGS_CSC_ZenithAzimuth(Sun) returned PGSCSC_W_BELOW_HORIZON (This is not an error condition - the sun is below the horizon at night); bit 10: PGS_CSC_ZenithAzimuth(Sun) returned PGSCSC_W_UNDEFINED_AZIMUTH; bit 11: PGS_CSC_ZenithAzimuth(Sun) returned PGSCSC_W_NO_REFRACTION; bit 12: PGS_CSC_ZenithAzimuth(Sun) returned PGSCSC_E_INVALID_VECTAG; bit 13: PGS_CSC_ZenithAzimuth(Sun) returned PGSCSC_E_LOOK_PT_ALTIT_RANGE; bit 14: PGS_CSC_ZenithAzimuth(Sun) returned PGSCSC_E_ZERO_INPUT_VECTOR; bit 15: PGS_CSC_ZenithAzimuth(Sun) returned PGS_E_TOOLKIT |
| demgeoqa | 16-bit unsigned integer | None | Digital Elevation Model (DEM) Geolocation QA flags: bit 0 (LSB): bad input value; bit 1: Could not allocate memory; bit 2: Too close to North or South pole. Excluded; bit 3: Layer resolution incompatibility. Excluded; bit 4: Any DEM Routine (elev) returned PGSDDEM_E_IMPROPER_TAG; bit 5: Any DEM Routine (elev) returned PGSDDEM_E_CANNOT_ACCESS_DATA; bit 6: Any DEM Routine (land/water) returned PGSDDEM_E_IMPROPER_TAG; bit 7: Any DEM Routine (land/water) returned PGSDDEM_E_CANNOT_ACCESS_DATA; bit 8: Reserved for future layers; bit 9: Reserved for future layers; bit 10: PGS_DEM_GetRegion(elev) returned PGSDDEM_M_FILLVALUE_INCLUDED; bit 11: PGS_DEM_GetRegion(land/water) returned PGSDDEM_M_FILLVALUE_INCLUDED; bit 12: Reserved for future layers; bit 13: PGS_DEM_GetRegion(all) returned PGSDDEM_M_MULTIPLE_RESOLUTIONS; bit 14: PGS_CSC_GetFOV_Pixel() returned any 'W' class return code except PGSCSC_W_PREDICTED_UT1; bit 15: PGS_CSC_GetFOV_Pixel() returned any 'E' class return code |
| satzen | 32-bit floating-point | None | Spacecraft zenith angle (0.0 ... 180.0) degrees from zenith (measured relative to the geodetic vertical on the reference (WGS84) spheroid and including corrections outlined in EOS SDP toolkit for normal accuracy.) |
| satazi | 32-bit floating-point | None | Spacecraft azimuth angle (-180.0 ... 180.0) degrees E of N GEO) |
| solzen | 32-bit floating-point | None | Solar zenith angle (0.0 ... 180.0) degrees from zenith (measured relative to the geodetic vertical on the reference (WGS84) spheroid and including corrections outlined in EOS SDP toolkit for normal accuracy.) |
| solazi | 32-bit floating-point | None | Solar azimuth angle (-180.0 ... 180.0) degrees E of N GEO) |
| sun_glint_distance | 16-bit integer | None | Distance (km) from footprint center to location of the sun glint (-9999 for unknown, 30000 for no glint visible because spacecraft is in Earth's shadow) |
| topog | 32-bit floating-point | None | Mean topography in meters above reference ellipsoid |
| topog_err | 32-bit floating-point | None | Error estimate for topog |
| landFrac | 32-bit floating-point | None | Fraction of spot that is land (0.0 ... 1.0) |
| landFrac_err | 32-bit floating-point | None | Error estimate for landFrac |
| state | 32-bit integer | None | Data state: 0:Process, 1:Special, 2:Erroneous, 3:Missing |
| Rdiff_swindow | 32-bit floating-point | None | Radiance difference in the 2560 cm ⁻¹ window region used to warn of possible errors caused by scene non-uniformity and misalignment of the beams: radiance(Rdiff_swindow_M1a_chan) - radiance(Rdiff_swindow_M2a_chan). (radiance units) |
| Rdiff_lwindow | 32-bit floating-point | None | Radiance difference in the longwave window(850 cm ⁻¹) used to warn of possible errors caused by scene non-uniformity and misalignment of the beams: radiance(Rdiff_lwindow_M8_chan) - radiance(Rdiff_lwindow_M9_chan). (radiance units) |
| Rdiff_strat | 32-bit floating-point | None | Radiance difference in the 2310 cm ⁻¹ CO2 R-Branch temperature sounding region used to warn of possible errors caused by scene non-uniformity and misalignment of the beams: radiance(Rdiff_strat_M1b_chan) - radiance(Rdiff_strat_M2b_chan). (radiance units) |
| Scenelnhomogeneous | 8-bit unsigned integer | None | Threshold test for scene inhomogeneity, using band-overlap detectors (bit fields). bit 7 (MSB): scene is inhomogeneous, as determined by the Rdiff_swindow threshold bit 6: scene is inhomogeneous, as determined by the Rdiff_lwindow threshold bit 5: scene is inhomogeneous, as determined by the Rdiff_strat threshold bits 4-0: unused (reserved) |

Size: 116336250 bytes (116.3 MB) per 45-scanset granule

**Total File Size (plus storage for dimensions and other HDF-EOS overhead):
122072554 bytes (122.1 MB) per 45-scanset granule = 29297.4 MB per day**

Special AIRS Types

Limited Engineering Struct: This type is used for engineering data fields for which there are known "yellow" limits

| Field Name | Type | Explanation |
|------------|-----------------------|--|
| min | 32-bit floating-point | Minimum value field takes on in granule (not valid when num_in = 0) |
| max | 32-bit floating-point | Maximum value field takes on in granule (not valid when num_in = 0) |
| mean | 32-bit floating-point | Mean of in-range values field takes on in granule (not valid when num_in = 0) |
| dev | 32-bit floating-point | Standard Deviation of in-range values field takes on in granule (not valid when num_in = 0) |
| num_in | 32-bit integer | Count of in-range values field takes on in granule |
| num_lo | 32-bit integer | Count of out-of-range low values field takes on in granule |
| num_hi | 32-bit integer | Count of out-of-range high values field takes on in granule |
| num_bad | 32-bit integer | Count of occasions on which field takes on invalid flag value (-9999) in granule |
| range_min | 32-bit floating-point | Minimum in-range value. Any value less than this is counted in num_lo and is not used in the calculation of mean & dev. |
| range_max | 32-bit floating-point | Maximum in-range value. Any value greater than this is counted in num_hi and is not used in the calculation of mean & dev. |
| missing | 8-bit integer | Missing limits flags. Bit 0 (LSB) is 1 when yellow low (range_min) limit is missing; Bit 1 is high when yellow high (range_max) limit is missing; other bits unused, set to 0. |
| max_track | 32-bit integer | GeoTrack index (counting from 1) where max was found |
| max_xtrack | 32-bit integer | GeoXTrack index (counting from 1) where max was found |
| min_track | 32-bit integer | GeoTrack index (counting from 1) where min was found |
| min_xtrack | 32-bit integer | GeoXTrack index (counting from 1) where min was found |

Unlimited Engineering Struct: This type is used for engineering data fields for which there are NOT known "yellow" limits

| Field Name | Type | Explanation |
|------------|-----------------------|---|
| min | 32-bit floating-point | Minimum value field takes on in granule (not valid when num = 0) |
| max | 32-bit floating-point | Maximum value field takes on in granule (not valid when num = 0) |
| mean | 32-bit floating-point | Mean of values field takes on in granule (not valid when num = 0) |
| dev | 32-bit floating-point | Standard Deviation of values field takes on in granule (not valid when num = 0) |
| num | 32-bit integer | Count of occurrences of field in granule (not including those counted in num_bad) |
| num_bad | 32-bit integer | Count of occasions on which field takes on invalid flag value (-9999) in granule |
| max_track | 32-bit integer | GeoTrack index (counting from 1) where max was found |
| max_xtrack | 32-bit integer | GeoXTrack index (counting from 1) where max was found |
| min_track | 32-bit integer | GeoTrack index (counting from 1) where min was found |
| min_xtrack | 32-bit integer | GeoXTrack index (counting from 1) where min was found |

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A1-9. L1B AIRS QA Interface Specification

Interface Specification Version 3.0.4.0
2003-05-19

ESDT ShortName = "AIRIBQAP"

Swath Name = "L1B_AIRS_QA"

Level = "level1B"

Footprints = 90

scanlines per scanset = 3

Dimensions

These fields define all dimensions that can be used for HDF-EOS swath fields.

The names "GeoTrack" and "GeoXTrack" have a special meaning for this document: "Cross-Track" data fields have a hidden dimension of "GeoXTrack"; "Along-Track" data fields have a hidden dimension of "GeoTrack"; "Full Swath Data Fields" have hidden dimensions of both "GeoTrack" and "GeoXTrack".

| Name | Value | Explanation |
|-------------------|--------------------------|---|
| GeoXTrack | 90 | Dimension across track for footprint positions. Same as number of footprints per scanline. -- starting at the left and increasing towards the right as you look along the satellite's path |
| GeoTrack | # of scan lines in swath | Dimension along track for footprint positions. Same as number of scanlines in granule. Parallel to the satellite's path, increasing with time. (Nominally 45 for Level-2, AMSU-A, and AIRS/Vis low-rate engineering; 135 for AIRS/Vis and HSB high-rate quantities) |
| CalXTrack | 6 | Dimension "across" track for calibration footprint positions. Same as number of calibration footprints per scanline. (NUM_FOOTPRINTS_AIRS_CALIB) (Footprints are ordered: 1-4: spaceviews (ports 3, 4, 1, 2); 5: blackbody radiometric calibration source; 6: spectral/photometric calibration sources) |
| SpaceXTrack | 4 | Dimension "across" track for spaceview calibration footprint positions in order of observation time. (NUM_FOOTPRINTS_AIRS_SPACE) |
| BBXTrack | 1 | Dimension "across" track for blackbody calibration footprint positions in order of observation time. (NUM_FOOTPRINTS_AIRS_BB) |
| Channel | 2378 | Dimension of channel array (Channels are generally in order of increasing wavenumber, but because frequencies can vary and because all detectors from a physical array of detector elements (a "module") are always grouped together there are sometimes small reversals in frequency order where modules overlap.) |
| MaxRefChannel | 100 | Maximum number of radiometric reference channels. "RefChannels" lists the channels used. |
| MaxFeaturesUpwell | 35 | Maximum number of spectral features in upwelling radiances used for spectral calibration |
| MaxFeaturesPary | 17 | Maximum number of spectral features in parylene radiances used for spectral calibration |

Geolocation Fields

These fields appear for every footprint (GeoTrack * GeoXTrack times) and correspond to footprint center coordinates and "shutter" time.

| Name | Explanation |
|-----------|--|
| Latitude | Footprint boresight geodetic Latitude in degrees North (-90.0 ... 90.0) |
| Longitude | Footprint boresight geodetic Longitude in degrees East (-180.0 ... 180.0) |
| Time | Footprint "shutter" TAI Time: floating-point elapsed seconds since Jan 1, 1993 |

Size: 291600 bytes (0.3 MB) per 45-scanset granule

Attributes

These fields appear only once per granule

| Name | Type | Extra Dimensions | Explanation |
|------------------|----------------------------|------------------|---|
| processing_level | string of 8-bit characters | None | Zero-terminated character string denoting processing level ("level1B") |
| instrument | string of 8-bit characters | None | Zero-terminated character string denoting instrument ("AIRS") |
| DayNightFlag | string of 8-bit characters | None | Zero-terminated character string denoting granule as day and/or night: (Always "Day", "Night", or "Both") |
| AutomaticQAFlag | string of 8-bit characters | None | Zero-terminated character string denoting granule data quality: (Always "Passed", "Failed", or "Suspect") |
| NumTotalData | 32-bit integer | None | Total number of expected scene footprints |

| | | | |
|-----------------|----------------------------|------|--|
| NumProcessData | 32-bit integer | None | Number of scene footprints which are present and can be processed routinely (state = 0) |
| NumSpecialData | 32-bit integer | None | Number of scene footprints which are present and can be processed only as a special test (state = 1) |
| NumBadData | 32-bit integer | None | Number of scene footprints which are present but cannot be processed (state = 2) |
| NumMissingData | 32-bit integer | None | Number of expected scene footprints which are not present (state = 3) |
| NumLandSurface | 32-bit integer | None | Number of scene footprints for which the surface is more than 90% land |
| NumOceanSurface | 32-bit integer | None | Number of scene footprints for which the surface is less than 10% land |
| node_type | string of 8-bit characters | None | Zero-terminated character string denoting whether granule is ascending, descending, or pole-crossing: ("Ascending" and "Descending" for entirely ascending or entirely descending granules, or "NorthPole" or "SouthPole" for pole-crossing granules) |
| start_year | 32-bit integer | None | Year in which granule started, UTC (e.g. 1999) |
| start_month | 32-bit integer | None | Month in which granule started, UTC (1 ... 12) |
| start_day | 32-bit integer | None | Day of month in which granule started, UTC (1 ... 31) |
| start_hour | 32-bit integer | None | Hour of day in which granule started, UTC (0 ... 23) |
| start_minute | 32-bit integer | None | Minute of hour in which granule started, UTC (0 ... 59) |
| start_sec | 32-bit floating-point | None | Second of minute in which granule started, UTC (0.0 ... 59.0) |
| start_orbit | 32-bit integer | None | Orbit number of mission in which granule started |
| end_orbit | 32-bit integer | None | Orbit number of mission in which granule ended |
| orbit_path | 32-bit integer | None | Orbit path of start orbit (1 ... 233 as defined by EOS project) |
| start_orbit_row | 32-bit integer | None | Orbit row at start of granule (1 ... 248 as defined by EOS project) |
| end_orbit_row | 32-bit integer | None | Orbit row at end of granule (1 ... 248 as defined by EOS project) |
| granule_number | 32-bit integer | None | Number of granule within day (1 ... 240) |
| num_scansets | 32-bit integer | None | Number of scansets in granule (1 ... 45) |
| num_scanlines | 32-bit integer | None | Number of scanlines in granule (3 * num_scansets) |
| start_Latitude | 64-bit floating-point | None | Geodetic Latitude of spacecraft at start of granule in degrees North (-90.0 ... 90.0) |
| start_Longitude | 64-bit floating-point | None | Geodetic Longitude of spacecraft at start of granule in degrees East (-180.0 ... 180.0) |
| start_Time | 64-bit floating-point | None | TAI Time at start of granule (floating-point elapsed seconds since start of 1993) |
| end_Latitude | 64-bit floating-point | None | Geodetic Latitude of spacecraft at end of granule in degrees North (-90.0 ... 90.0) |
| end_Longitude | 64-bit floating-point | None | Geodetic Longitude of spacecraft at end of granule in degrees East (-180.0 ... 180.0) |
| end_Time | 64-bit floating-point | None | TAI Time at end of granule (floating-point elapsed seconds since start of 1993) |
| eq_x_longitude | 32-bit floating-point | None | Longitude of spacecraft at southward equator crossing nearest granule start in degrees East (-180.0 ... 180.0) |
| eq_x_tai | 64-bit floating-point | None | Time of eq_x_longitude in TAI units (floating-point elapsed seconds since start of 1993) |
| orbitgeoqa | 32-bit unsigned integer | None | Orbit Geolocation QA: bit 0 (LSB): bad input value (last scanline); bit 1: bad input value (first scanline); bit 2: PGS_EPH_GetEphMet() returned PGSEPH_E_NO_SC_EPHEM_FILE; bit 3: PGS_EPH_GetEphMet() returned PGSEPH_E_BAD_ARRAY_SIZE; bit 4: PGS_EPH_GetEphMet() returned PGSTD_E_TIME_FMT_ERROR; bit 5: PGS_EPH_GetEphMet() returned PGSTD_E_TIME_VALUE_ERROR; bit 6: PGS_EPH_GetEphMet() returned PGSTD_E_SC_TAG_UNKNOWN; bit 7: PGS_EPH_GetEphMet() returned PGS_E_TOOLKIT; bit 8: PGS_TD_UTCtoTAI() returned PGSTD_E_NO_LEAP_SECS; bit 9: PGS_TD_UTCtoTAI() returned PGSTD_E_TIME_FMT_ERROR; bit 10: PGS_TD_UTCtoTAI() returned PGSTD_E_TIME_VALUE_ERROR; bit 11: PGS_TD_UTCtoTAI() returned PGS_E_TOOLKIT; bit 12: PGS_CSC_DayNight() returned PGSTD_E_NO_LEAP_SECS; bit 13: PGS_CSC_DayNight() returned PGSCSC_E_INVALID_LIMITTAG; bit 14: PGS_CSC_DayNight() returned PGSCSC_E_BAD_ARRAY_SIZE; bit 15: PGS_CSC_DayNight() returned PGSCSC_W_ERROR_IN_DAYNIGHT; bit 16: PGS_CSC_DayNight() returned PGSCSC_W_BAD_TRANSFORM_VALUE; bit 17: PGS_CSC_DayNight() returned PGSCSC_W_BELOW_HORIZON; bit 18: PGS_CSC_DayNight() returned PGSCSC_W_PREDICTED_UT1; bit 19: PGS_CSC_DayNight() returned PGSTD_E_NO_UT1_VALUE; bit 20: PGS_CSC_DayNight() returned PGSTD_E_BAD_INITIAL_TIME; bit 21: PGS_CSC_DayNight() returned PGSCRP_E_TIME_OUT_OF_RANGE; bit |

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|---------------------|--|--------------------------------------|---|
| | | | 22: PGS_CSC_DayNight() returned PGSCBP_E_UNABLE_TO_OPEN_FILE; bit 22: PGS_CSC_DayNight() returned PGSMEM_E_NO_MEMORY; bit 24: PGS_CSC_DayNight() returned PGS_E_TOOLKIT; bit 25-31: not used |
| num_satgeoqa | 16-bit integer | None | Number of scans with problems in satgeoqa |
| num_glintgeoqa | 16-bit integer | None | Number of scans with problems in glintgeoqa |
| num_moongoqa | 16-bit integer | None | Number of scans with problems in moongoqa |
| num_ftptgeoqa | 16-bit integer | None | Number of footprints with problems in ftptgeoqa |
| num_zengeoqa | 16-bit integer | None | Number of footprints with problems in zengeoqa |
| num_demgeoqa | 16-bit integer | None | Number of footprints with problems in demgeoqa |
| num_fpe | 16-bit integer | None | Number of floating point errors |
| LonGranuleCen | 16-bit integer | None | Geodetic Longitude of the center of the granule in degrees East (-180 ... 180) |
| LatGranuleCen | 16-bit integer | None | Geodetic Latitude of the center of the granule in degrees North (-90 ... 90) |
| LocTimeGranuleCen | 16-bit integer | None | Local solar time at the center of the granule in minutes past midnight (0 ... 1439) |
| CalGranSummary | 8-bit unsigned integer | None | Bit field. Bitwise OR of CalChanSummary, over all good channels (see ExcludedChans) Zero means all good channels were well calibrated, for all scanlines. bit 7 (MSB): scene over/underflow; bit 6: anomaly in offset calculation; bit 5: anomaly in gain calculation; bit 4: pop detected; bit 3: noise out of bounds; bit 2: anomaly in spectral calibration; bit 1: Telemetry; bit 0: unused (reserved); |
| CalChanSummary | 8-bit unsigned integer | Channel (= 2378) | Bit field. Bitwise OR of CalFlag, by channel, over all scanlines. Noise threshold and spectral quality added. Zero means the channel was well calibrated for all scanlines bit 7 (MSB): scene over/underflow; bit 6: anomaly in offset calculation; bit 5: anomaly in gain calculation; bit 4: pop detected; bit 3: noise out of bounds; bit 2: anomaly in spectral calibration; bit 1: Telemetry; bit 0: unused (reserved); |
| ExcludedChans | 8-bit unsigned integer | Channel (= 2378) | An integer 0-6, indicating A/B detector weights. Used in L1B processing. 0 - A weight = B weight. Probably better than channels with state > 2; 1 - A-side only. Probably better than channels with state > 2; 2 - B-side only. Probably better than channels with state > 2; 3 - A weight = B weight. Probably better than channels with state = 6; 4 - A-side only. Probably better than channels with state = 6; 5 - B-side only. Probably better than channels with state = 6; 6 - A weight = B weight. |
| NeN | 32-bit floating-point | Channel (= 2378) | Noise-equivalent Radiance (radiance units) for an assumed 250K scene |
| DCR_scan | 16-bit integer | None | Scanline number of (first) DC-Restore. 0 for no DC-Restore |
| input_scene_counts | Limited Engineering Struct (see below) | Channel (= 2378) | Input statistics on scene data numbers |
| input_space_counts | Limited Engineering Struct (see below) | SpaceXTrack (= 4) * Channel (= 2378) | Input statistics on spaceview data numbers |
| input_space_signals | Limited Engineering Struct (see below) | SpaceXTrack (= 4) * Channel (= 2378) | Input statistics on spaceview signals (data numbers with offset subtracted) |
| input_space_diffs | Unlimited Engineering Struct (see below) | SpaceXTrack (= 4) * Channel (= 2378) | Statistics on differences between corresponding space views, for consecutive scanlines |
| input_bb_counts | Limited Engineering Struct (see below) | Channel (= 2378) | Input statistics on blackbody calibration data numbers |
| input_bb_signals | Limited Engineering Struct (see below) | Channel (= 2378) | Input statistics on blackbody calibration signals (data numbers with offset subtracted) |
| input_spec_counts | Limited Engineering Struct (see below) | Channel (= 2378) | Input statistics on spectral calibration data numbers |
| input_bb_temp | Limited Engineering Struct (see below) | None | Input statistics on Blackbody temperature |

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| input_bb_temp1 | Limited Engineering Struct (see below) | None | Input statistics on Blackbody temperature 1A (CaBbTempV1A or CaBbTempV1B, as active) |
| input_bb_temp2 | Limited Engineering Struct (see below) | None | Input statistics on Blackbody temperature 2 (CaBbTempV2A or CaBbTempV2B, as active) |
| input_bb_temp3 | Limited Engineering Struct (see below) | None | Input statistics on Blackbody temperature 3 (CaBbTemp3, active A or B) |
| input_bb_temp4 | Limited Engineering Struct (see below) | None | Input statistics on Blackbody temperature4 (CaBbTemp4, active A or B) |
| input_spec_temp | Limited Engineering Struct (see below) | None | Input statistics on Spectrometer temperature |
| input_ir_det_temp | Limited Engineering Struct (see below) | None | Input statistics on IR detector temperature |
| input_grating_temp_1 | Limited Engineering Struct (see below) | None | Input statistics on Grating temperature 1 (SpGratngTemp1, active A or B) |
| input_grating_temp_2 | Limited Engineering Struct (see below) | None | Input statistics on Grating temperature 2 (SpGratngTemp2, active A or B) |
| input_entr_filt_temp | Limited Engineering Struct (see below) | None | Input statistics on the entrance filter temperature (SpEntFiltTmp, active A or B) |
| input_opt_bench_temp_2 | Limited Engineering Struct (see below) | None | Input statistics on optical bench temperature 2 (SpOptBnchTmp2, active A or B) |
| input_opt_bench_temp_3 | Limited Engineering Struct (see below) | None | Input statistics on optical bench temperature 3 (SpOptBnchTmp3, active A or B) |
| input_scan_mirror_temp | Limited Engineering Struct (see below) | None | Input statistics on scan mirror housing temperature |
| input_chopper_phase_err | Limited Engineering Struct (see below) | None | Input statistics on chopper phase error voltage (ChPhaseErrVA or ChPhaseErrVB, as active) |
| PopCount | 32-bit integer | None | Number of popcorn events within granule, i.e. number of times than an AIRS channel used in the Level 2 retrieval has suffered a sudden discontinuity in dark current |
| offset_stats | Unlimited Engineering Struct (see below) | Channel (= 2378) | Statistics on offsets |
| gain_stats | Unlimited Engineering Struct (see below) | Channel (= 2378) | Statistics on gains |
| rad_stats | Unlimited Engineering Struct (see below) | Channel (= 2378) | Statistics on radiances (radiance units) |
| NumRefChannels | 32-bit integer | None | The number of channels reported in MaxRefChannel arrays |
| RefChannels | 32-bit integer | MaxRefChannel (= 100) | The 1-based indexes of channels reported in MaxRefChannel arrays |
| rad_scan_stats | Unlimited Engineering Struct (see below) | GeoXTrack (= 90) * MaxRefChannel (= 100) | Statistics on scan angle dependence of radiances |

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| Rdiff_swindow_M1a_chan | 16-bit integer | None | Array M1a channel used as one reference in calculating Rdiff_swindow. (index into radiance & frequency arrays 1...2378) |
| Rdiff_swindow_M2a_chan | 16-bit integer | None | Array M2a channel used as one reference in calculating Rdiff_swindow. (index into radiance & frequency arrays 1...2378) |
| Rdiff_lwindow_M8_chan | 16-bit integer | None | Array M8 channel used as one reference in calculating Rdiff_lwindow. (index into radiance & frequency arrays 1...2378) |
| Rdiff_lwindow_M9_chan | 16-bit integer | None | Array M9 channel used as one reference in calculating Rdiff_lwindow. (index into radiance & frequency arrays 1...2378) |
| Rdiff_strat_M2b_chan | 16-bit integer | None | Array M2b channel used as one reference in calculating Rdiff_strat. (index into radiance & frequency arrays 1...2378) |
| Rdiff_strat_M1b_chan | 16-bit integer | None | Array M1b channel used as one reference in calculating Rdiff_strat. (index into radiance & frequency arrays 1...2378) |
| granules_present | string of 8-bit characters | None | Zero-terminated character string denoting which adjacent granules were available for smoothing ("All" for both previous & next, "Prev" for previous but not next, "Next" for next but not previous, "None" for neither previous nor next) |
| spectral_TAI | 64-bit floating-point | None | TAI time of (first) Spectral calibration. (floating-point elapsed seconds since start of 1993) 0 for no Spectral calibration occurred in this granule. |
| nominal_freq | 32-bit floating-point | Channel (= 2378) | Nominal frequencies (in cm ⁻¹) of each channel |
| spectral_freq | 32-bit floating-point | Channel (= 2378) | Calculated frequencies (in cm ⁻¹) |
| spectral_freq_unc | 32-bit floating-point | Channel (= 2378) | Uncertainty in calculated frequencies (in cm ⁻¹) |
| spec_shift_upwell | 32-bit floating-point | None | Focal plane shift calculated in grating model fit to upwelling radiances (microns) |
| spec_shift_unc_upwell | 32-bit floating-point | None | Uncertainty of the focal plane shift calculated in the grating model fit to upwelling radiances (microns) |
| spec_fl_upwell | 32-bit floating-point | None | Focal length calculated in grating model fit to upwelling radiances (microns) |
| spec_fl_unc_upwell | 32-bit floating-point | None | Uncertainty of focal length calculated in grating model fit to upwelling radiances (microns) |
| SpectralFeaturesUpwell | 32-bit integer | None | The actual number of upwelling features for MaxFeaturesUpwell-sized arrays |
| spec_feature_shifts_upwell | 32-bit floating-point | MaxFeaturesUpwell (= 35) | Spectral shift seen for each upwelling feature, in microns at the focal plane |
| spec_feature_corr_upwell | 32-bit floating-point | MaxFeaturesUpwell (= 35) | Maximum correlation seen for each upwelling feature (0.0 ... 1.0) |
| spec_feature_sharp_upwell | 32-bit floating-point | MaxFeaturesUpwell (= 35) | Quadratic coefficient in fit to correlation for each upwelling feature |
| spec_feature_resid_upwell | 32-bit floating-point | MaxFeaturesUpwell (= 35) | Fit residual for each upwelling feature (wavenumbers) |
| spec_iter_upwell | 16-bit integer | None | Number of amoeba iterations to fit the grating model to upwelling radiance feature positions |
| spec_feature_contrast_stats | Limited Engineering Struct (see below) | MaxFeaturesUpwell (= 35) | Statistics on the spectral contrasts for each of the upwelling features, for each of the scene footprints considered for spectral calibration |
| spec_clim_select | 16-bit integer | None | Number of the climatology to which the upwelling features were fitted |
| spec_shift_pary | 32-bit floating-point | None | Focal plane shift calculated in grating model fit to parylene radiances (microns) |
| spec_shift_unc_pary | 32-bit floating-point | None | Uncertainty of the focal plane shift calculated in grating model fit to parylene radiances (microns) |
| spec_fl_pary | 32-bit floating-point | None | Focal length calculated in grating model fit to parylene radiances (microns) |
| spec_fl_unc_pary | 32-bit floating-point | None | Uncertainty of focal length calculated in grating model fit to parylene radiances (microns) |
| SpectralFeaturesPary | 32-bit integer | None | The actual number of parylene features for MaxFeaturesPary-sized arrays |
| spec_feature_shifts_pary | 32-bit floating-point | MaxFeaturesPary (= 17) | Spectral shift seen for each parylene feature, in microns at the focal plane |
| spec_feature_corr_pary | 32-bit floating-point | MaxFeaturesPary (= 17) | Maximum correlation seen for each parylene feature (0.0 ... 1.0) |
| spec_feature_sharp_pary | 32-bit floating-point | MaxFeaturesPary (= 17) | Quadratic coefficient in fit to correlation for each parylene feature |

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| spec_feature_resid_pary | 32-bit floating-point | MaxFeaturesPary (= 17) | Fit residual for each parylene feature (wavenumbers) |
| spec_iter_pary | 16-bit integer | None | Number of amoeba iterations in fit the grating model to parylene radiance feature positions |
| ave_pary_spectrum | 32-bit floating-point | Channel (= 2378) | The average parylene spectrum (over good scanlines), in milliWatts/m**2/cm**-1/steradian |
| DCRCOUNT | 32-bit integer | None | Number of times a Direct Current Restore was executed for any module |

Size: 3776779 bytes (3.8 MB) per granule

Along-Track Data Fields

These fields appear once per scanline (GeoTrack times)

| Name | Type | Extra Dimensions | Explanation |
|------------|-------------------------|------------------|--|
| satheight | 32-bit floating-point | None | Satellite altitude at nadirTAI in km above reference ellipsoid (e.g. 725.2) |
| satroll | 32-bit floating-point | None | Satellite attitude roll angle at nadirTAI (-180.0 ... 180.0 angle about the +x (roll) ORB axis, +x axis is positively oriented in the direction of orbital flight completing an orthogonal triad with y and z.) |
| satpitch | 32-bit floating-point | None | Satellite attitude pitch angle at nadirTAI (-180.0 ... 180.0 angle about +y (pitch) ORB axis, +y axis is oriented normal to the orbit plane with the positive sense opposite to that of the orbit's angular momentum vector H.) |
| satyaw | 32-bit floating-point | None | Satellite attitude yaw angle at nadirTAI (-180.0 ... 180.0 angle about +z (yaw) axis, +z axis is positively oriented earthward parallel to the satellite radius vector R from the spacecraft center of mass to the center of the Earth.) |
| satgeoqa | 32-bit unsigned integer | None | Satellite Geolocation QA flags: bit 0 (LSB): bad input value; bit 1: PGS_TD_TAItUTC() returned PGSTD_E_NO_LEAP_SECS; bit 2: PGS_TD_TAItUTC() returned PGS_E_TOOLKIT; bit 3: PGS_EPH_EphemAttit() returned PGSEPH_W_BAD_EPHEM_VALUE; bit 4: PGS_EPH_EphemAttit() returned PGSEPH_E_BAD_EPHEM_FILE_HDR; bit 5: PGS_EPH_EphemAttit() returned PGSEPH_E_NO_SC_EPHEM_FILE; bit 6: PGS_EPH_EphemAttit() returned PGSEPH_E_NO_DATA_REQUESTED; bit 7: PGS_EPH_EphemAttit() returned PGSTD_E_SC_TAG_UNKNOWN; bit 8: PGS_EPH_EphemAttit() returned PGSEPH_E_BAD_ARRAY_SIZE; bit 9: PGS_EPH_EphemAttit() returned PGSTD_E_TIME_FMT_ERROR; bit 10: PGS_EPH_EphemAttit() returned PGSTD_E_TIME_VALUE_ERROR; bit 11: PGS_EPH_EphemAttit() returned PGSTD_E_NO_LEAP_SECS; bit 12: PGS_EPH_EphemAttit() returned PGS_E_TOOLKIT; bit 13: PGS_CSC_ECIttoECR() returned PGSCSC_W_BAD_TRANSFORM_VALUE; bit 14: PGS_CSC_ECIttoECR() returned PGSCSC_E_BAD_ARRAY_SIZE; bit 15: PGS_CSC_ECIttoECR() returned PGSTD_E_NO_LEAP_SECS; bit 16: PGS_CSC_ECIttoECR() returned PGSTD_E_TIME_FMT_ERROR; bit 17: PGS_CSC_ECIttoECR() returned PGSTD_E_TIME_VALUE_ERROR; bit 18: unused (set to zero); bit 19: PGS_CSC_ECIttoECR() returned PGSTD_E_NO_UT1_VALUE; bit 20: PGS_CSC_ECIttoECR() returned PGS_E_TOOLKIT; bit 21: PGS_CSC_ECRtoGEO() returned PGSCSC_W_TOO_MANY_ITERS; bit 22: PGS_CSC_ECRtoGEO() returned PGSCSC_W_INVALID_ALTITUDE; bit 23: PGS_CSC_ECRtoGEO() returned PGSCSC_W_SPHERE_BODY; bit 24: PGS_CSC_ECRtoGEO() returned PGSCSC_W_LARGE_FLATTENING; bit 25: PGS_CSC_ECRtoGEO() returned PGSCSC_W_DEFAULT_EARTH_MODEL; bit 26: PGS_CSC_ECRtoGEO() returned PGSCSC_E_BAD_EARTH_MODEL; bit 27: PGS_CSC_ECRtoGEO() returned PGS_E_TOOLKIT; bit 28-31: not used |
| glintgeoqa | 16-bit unsigned integer | None | Glint Geolocation QA flags: bit 0 (LSB): bad input value; bit 1: glint location in Earth's shadow; bit 2: glint calculation not converging; bit 3: glint location sun vs. satellite zenith mismatch; bit 4: glint location sun vs. satellite azimuth mismatch; bit 5: bad glint location; bit 6: PGS_CSC_ZenithAzimuth() returned any 'W' class return code; bit 7: PGS_CSC_ZenithAzimuth() returned any 'E' class return code; bit 8: PGS_CBP_Earth_CB_Vector() returned returned any 'W' class return code; bit 9: PGS_CBP_Earth_CB_Vector() returned returned any 'E' class return code; bit 10: PGS_CSC_ECIttoECR() returned any 'W' class return code except PGSCSC_W_PREDICTED_UT1 (for Glint); bit 11: PGS_CSC_ECIttoECR() returned any 'E' class return code (for Glint); bit 12: PGS_CSC_ECRtoGEO() returned any 'W' class return code (for Glint); bit 13: PGS_CSC_ECRtoGEO() returned any 'E' class return code (for Glint); bit 14: PGS_CSC_ECIttoECR() returned any 'W' class return code except PGSCSC_W_PREDICTED_UT1; bit 15: PGS_CSC_ECIttoECR() returned any 'E' class return code |
| moongeoa | 16-bit unsigned integer | None | Moon Geolocation QA flags: bit 0 (LSB): bad input value; bit 1: PGS_TD_TAItUTC() returned PGSTD_E_NO_LEAP_SECS; bit 2: PGS_TD_TAItUTC() returned PGS_E_TOOLKIT; bit 3: PGS_CBP_Sat_CB_Vector() returned PGSCSC_W_BELOW_SURFACE; bit 4: PGS_CBP_Sat_CB_Vector() returned PGSCBP_W_BAD_CB_VECTOR; bit 5: PGS_CBP_Sat_CB_Vector() returned PGSCBP_E_BAD_ARRAY_SIZE; bit 6: PGS_CBP_Sat_CB_Vector() returned PGSCBP_E_INVALID_CB_ID; bit 7: PGS_CBP_Sat_CB_Vector() returned PGSMEM_E_NO_MEMORY; bit 8: PGS_CBP_Sat_CB_Vector() returned PGSCBP_E_UNABLE_TO_OPEN_FILE; bit 9: PGS_CBP_Sat_CB_Vector() returned PGSTD_E_BAD_INITIAL_TIME; bit 10: PGS_CBP_Sat_CB_Vector() returned PGSCBP_E_TIME_OUT_OF_RANGE; bit 11: PGS_CBP_Sat_CB_Vector() returned PGSCBP_E_SC_TAG_UNKNOWN; bit 12: PGS_CBP_Sat_CB_Vector() returned PGSEPH_E_BAD_EPHEM_FILE_HDR; bit 13: PGS_CBP_Sat_CB_Vector() returned PGSEPH_E_NO_SC_EPHEM_FILE; bit 14: PGS_CBP_Sat_CB_Vector() returned |

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| | | | PGS_E_TOOLKIT; bit 15: not used |
| nadirTAI | 64-bit floating-point | None | TAI time at which instrument is nominally looking directly down. (between footprints 15 & 16 for AMSU or between footprints 45 & 46 for AIRS/ViS & HSB) (floating-point elapsed seconds since start of 1993) |
| sat_lat | 64-bit floating-point | None | Satellite geodetic latitude in degrees North (-90.0 ... 90.0) |
| sat_lon | 64-bit floating-point | None | Satellite geodetic longitude in degrees East (-180.0 ... 180.0) |
| scan_node_type | 8-bit integer | None | 'A' for ascending, 'D' for descending, 'N' for North-Polar, 'S' for South-Polar |
| glintlat | 32-bit floating-point | None | Solar glint geodetic latitude in degrees North at nadirTAI (-90.0 ... 90.0) |
| glintlon | 32-bit floating-point | None | Solar glint geodetic longitude in degrees East at nadirTAI (-180.0 ... 180.0) |
| CalScanSummary | 8-bit unsigned integer | None | Bit field. Bitwise OR of CalFlag over the good channel list (see ExcludedChans). Zero means all "good" channels were well calibrated for this scanline bit 7 (MSB): scene over/underflow; bit 6: anomaly in offset calculation; bit 5: anomaly in gain calculation; bit 4: pop detected; bit 3: DCR Occurred; bit 2: Moon in View; bit 1: telemetry out of limit condition; bit 0: unused (reserved) |
| CalFlag | 8-bit unsigned integer | Channel (= 2378) | Bit field, by channel, for the current scanline. Zero means the channel was well calibrated, for this scanline. bit 7 (MSB): scene over/underflow; bit 6: anomaly in offset calculation; bit 5: anomaly in gain calculation; bit 4: pop detected; bit 3: DCR Occurred; bit 2: Moon in View; bit 1: telemetry out of limit condition; bit 0: unused (reserved) |
| SpaceViewDelta | 32-bit floating-point | Channel (= 2378) | The mean of the four spaceviews immediately following the Earth views in the scanline, minus the mean of the spaceviews immediately preceding the Earth views in the scanline (also the magnitude of a "pop" in this scanline, when the "pop detected" bit is set in CalFlag.) (data numbers) |
| spaceview_selection | 8-bit unsigned integer | None | Indicates which footprints were included for this scan. Each bit is high when the corresponding space view is used in the spaceview offset calculation. (See L1B Processing Requirements, section 6.2); LSB is first space view. |
| gain | 32-bit floating-point | MaxRefChannel (= 100) | Gain: number of radiance units per count |
| OpMode | 16-bit unsigned integer | None | Instrument Operations Mode. See AIRS Command Handbook, section 6.4 for a definition of each bit. bits 0 (LSB)-2 cal phase; bits 3-6 Cal Func; bit 7 quicklook (expedited) flag; bits 8-11 submode bits 12-14 Mode (0=standby, 1=ready, 2=operate, 3=checkout, 4=decontaminate, 5=off, 6=survival); bit 16 transition flag |
| DpCircCount | 16-bit unsigned integer | None | Data Processing circumvention counts (active A or B) (counts) |
| DpCircBasThr | 16-bit unsigned integer | None | Data Processing circumvention base threshold (active A or B) |

Size: 1667925 bytes (1.7 MB) per 45-scanset granule

Full Swath Data Fields

These fields appear for every footprint of every scanline in the granule (GeoTrack * GeoXTrack times)

| Name | Type | Extra Dimensions | Explanation |
|-----------|-------------------------|------------------|---|
| scanang | 32-bit floating-point | None | Scanning angle of AIRS instrument with respect to the AIRS Instrument for this footprint (-180.0 ... 180.0, negative at start of scan, 0 at nadir) |
| ftptgeoqa | 32-bit unsigned integer | None | Footprint Geolocation QA flags: bit 0 (LSB): bad input value; bit 1: PGS_TD_TAtoUTC() returned PGSTD_E_NO_LEAP_SECS; bit 2: PGS_TD_TAtoUTC() returned PGS_E_TOOLKIT; bit 3: PGS_CSC_GetFOV_Pixel() returned PGSCSC_W_MISS_EARTH; bit 4: PGS_CSC_GetFOV_Pixel() returned PGSTD_E_SC_TAG_UNKNOWN; bit 5: PGS_CSC_GetFOV_Pixel() returned PGSCSC_W_ZERO_PIXEL_VECTOR; bit 6: PGS_CSC_GetFOV_Pixel() returned PGSCSC_W_BAD_EPH_FOR_PIXEL; bit 7: PGS_CSC_GetFOV_Pixel() returned PGSCSC_W_INSTRUMENT_OFF_BOARD; bit 8: PGS_CSC_GetFOV_Pixel() returned PGSCSC_W_BAD_ACCURACY_FLAG; bit 9: PGS_CSC_GetFOV_Pixel() returned PGSCSC_E_BAD_ARRAY_SIZE; bit 10: PGS_CSC_GetFOV_Pixel() returned PGSCSC_W_DEFAULT_EARTH_MODEL; bit 11: PGS_CSC_GetFOV_Pixel() returned PGSCSC_W_DATA_FILE_MISSING; bit 12: PGS_CSC_GetFOV_Pixel() returned PGSCSC_E_NEG_OR_ZERO_RAD; bit 13: PGS_CSC_GetFOV_Pixel() returned PGSMEM_E_NO_MEMORY; bit 14: PGS_CSC_GetFOV_Pixel() returned PGSTD_E_NO_LEAP_SECS; bit 15: PGS_CSC_GetFOV_Pixel() returned PGSTD_E_TIME_FMT_ERROR; bit 16: PGS_CSC_GetFOV_Pixel() returned PGSTD_E_TIME_VALUE_ERROR; bit 17: PGS_CSC_GetFOV_Pixel() returned PGSCSC_W_PREDICTED_UT1; bit 18: PGS_CSC_GetFOV_Pixel() returned PGSTD_E_NO_UT1_VALUE; bit 19: PGS_CSC_GetFOV_Pixel() returned PGS_E_TOOLKIT; bit 20: PGS_CSC_GetFOV_Pixel() returned PGSEPH_E_BAD_EPHEM_FILE_HDR; bit 21: PGS_CSC_GetFOV_Pixel() returned PGSEPH_E_NO_SC_EPHEM_FILE; bit 22-31: not used |
| zengeoqa | 16-bit unsigned integer | None | Satellite zenith Geolocation QA flags: bit 0 (LSB): (Spacecraft) bad input value; bit 1: PGS_CSC_ZenithAzimuth(S/C) returned PGSCSC_W_BELOW_HORIZON; bit 2: PGS_CSC_ZenithAzimuth(S/C) returned PGSCSC_W_UNDEFINED_AZIMUTH; bit 3: |

| | | | |
|--------------------|-------------------------|------|--|
| | | | PGS_CSC_ZenithAzimuth(S/C) returned PGSCSC_W_NO_REFRACTION; bit 4: PGS_CSC_ZenithAzimuth(S/C) returned PGSCSC_E_INVALID_VECTAG; bit 5: PGS_CSC_ZenithAzimuth(S/C) returned PGSCSC_E_LOOK_PT_ALTIT_RANGE; bit 6: PGS_CSC_ZenithAzimuth(S/C) returned PGSCSC_E_ZERO_INPUT_VECTOR; bit 7: PGS_CSC_ZenithAzimuth(S/C) returned PGS_E_TOOLKIT; bit 8: (Sun) bad input value; bit 9: (suppressed) PGS_CSC_ZenithAzimuth(Sun) returned PGSCSC_W_BELOW_HORIZON (This is not an error condition - the sun is below the horizon at night); bit 10: PGS_CSC_ZenithAzimuth(Sun) returned PGSCSC_W_UNDEFINED_AZIMUTH; bit 11: PGS_CSC_ZenithAzimuth(Sun) returned PGSCSC_W_NO_REFRACTION; bit 12: PGS_CSC_ZenithAzimuth(Sun) returned PGSCSC_E_INVALID_VECTAG; bit 13: PGS_CSC_ZenithAzimuth(Sun) returned PGSCSC_E_LOOK_PT_ALTIT_RANGE; bit 14: PGS_CSC_ZenithAzimuth(Sun) returned PGSCSC_E_ZERO_INPUT_VECTOR; bit 15: PGS_CSC_ZenithAzimuth(Sun) returned PGS_E_TOOLKIT |
| demgeoqa | 16-bit unsigned integer | None | Digital Elevation Model (DEM) Geolocation QA flags: bit 0 (LSB): bad input value; bit 1: Could not allocate memory; bit 2: Too close to North or South pole. Excluded; bit 3: Layer resolution incompatibility. Excluded; bit 4: Any DEM Routine (elev) returned PGSDM_E_IMPROPER_TAG; bit 5: Any DEM Routine (elev) returned PGSDM_E_CANNOT_ACCESS_DATA; bit 6: Any DEM Routine (land/water) returned PGSDM_E_IMPROPER_TAG; bit 7: Any DEM Routine (land/water) returned PGSDM_E_CANNOT_ACCESS_DATA; bit 8: Reserved for future layers; bit 9: Reserved for future layers; bit 10: PGS_DEM_GetRegion(elev) returned PGSDM_M_FILLVALUE_INCLUDED; bit 11: PGS_DEM_GetRegion(land/water) returned PGSDM_M_FILLVALUE_INCLUDED; bit 12: Reserved for future layers; bit 13: PGS_DEM_GetRegion(all) returned PGSDM_M_MULTIPLE_RESOLUTIONS; bit 14: PGS_CSC_GetFOV_Pixel() returned any 'W' class return code except PGSCSC_W_PREDICTED_UT1; bit 15: PGS_CSC_GetFOV_Pixel() returned any 'E' class return code |
| satzen | 32-bit floating-point | None | Spacecraft zenith angle (0.0 ... 180.0) degrees from zenith (measured relative to the geodetic vertical on the reference (WGS84) spheroid and including corrections outlined in EOS SDP toolkit for normal accuracy.) |
| satazi | 32-bit floating-point | None | Spacecraft azimuth angle (-180.0 ... 180.0) degrees E of N GEO) |
| solzen | 32-bit floating-point | None | Solar zenith angle (0.0 ... 180.0) degrees from zenith (measured relative to the geodetic vertical on the reference (WGS84) spheroid and including corrections outlined in EOS SDP toolkit for normal accuracy.) |
| solazi | 32-bit floating-point | None | Solar azimuth angle (-180.0 ... 180.0) degrees E of N GEO) |
| sun_glint_distance | 16-bit integer | None | Distance (km) from footprint center to location of the sun glint (-9999 for unknown, 30000 for no glint visible because spacecraft is in Earth's shadow) |
| topog | 32-bit floating-point | None | Mean topography in meters above reference ellipsoid |
| topog_err | 32-bit floating-point | None | Error estimate for topog |
| landFrac | 32-bit floating-point | None | Fraction of spot that is land (0.0 ... 1.0) |
| landFrac_err | 32-bit floating-point | None | Error estimate for landFrac |
| state | 32-bit integer | None | Data state: 0:Process, 1:Special, 2:Erroneous, 3:Missing |
| Rdiff_swindow | 32-bit floating-point | None | Radiance difference in the 2560 cm ⁻¹ window region used to warn of possible errors caused by scene non-uniformity and misalignment of the beams: radiance(Rdiff_swindow_M1a_chan) - radiance(Rdiff_swindow_M2a_chan). (radiance units) |
| Rdiff_lwindow | 32-bit floating-point | None | Radiance difference in the longwave window(850 cm ⁻¹) used to warn of possible errors caused by scene non-uniformity and misalignment of the beams: radiance(Rdiff_lwindow_M8_chan) - radiance(Rdiff_lwindow_M9_chan). (radiance units) |
| Rdiff_strat | 32-bit floating-point | None | Radiance difference in the 2310 cm ⁻¹ CO2 R-Branch temperature sounding region used to warn of possible errors caused by scene non-uniformity and misalignment of the beams: radiance(Rdiff_strat_M1b_chan) - radiance(Rdiff_strat_M2b_chan). (radiance units) |
| SceneInhomogeneous | 8-bit unsigned integer | None | Threshold test for scene inhomogeneity, using band-overlap detectors (bit fields). bit 7 (MSB): scene is inhomogeneous, as determined by the Rdiff_swindow threshold bit 6: scene is inhomogeneous, as determined by the Rdiff_lwindow threshold bit 5: scene is inhomogeneous, as determined by the Rdiff_strat threshold bits 4-0: unused (reserved) |

Size: 765450 bytes (0.8 MB) per 45-scanset granule

**Total File Size (plus storage for dimensions and other HDF-EOS overhead):
6501754 bytes (6.5 MB) per 45-scanset granule = 1560.4 MB per day**

Special AIRS Types

Limited Engineering Struct: This type is used for engineering data fields for which there are known "yellow" limits

| Field Name | Type | Explanation |
|------------|-----------------------|--|
| min | 32-bit floating-point | Minimum value field takes on in granule (not valid when num_in = 0) |
| max | 32-bit floating-point | Maximum value field takes on in granule (not valid when num_in = 0) |
| mean | 32-bit floating-point | Mean of in-range values field takes on in granule (not valid when num_in = 0) |
| dev | 32-bit floating-point | Standard Deviation of in-range values field takes on in granule (not valid when num_in = 0) |
| num_in | 32-bit integer | Count of in-range values field takes on in granule |
| num_lo | 32-bit integer | Count of out-of-range low values field takes on in granule |
| num_hi | 32-bit integer | Count of out-of-range high values field takes on in granule |
| num_bad | 32-bit integer | Count of occasions on which field takes on invalid flag value (-9999) in granule |
| range_min | 32-bit floating-point | Minimum in-range value. Any value less than this is counted in num_lo and is not used in the calculation of mean & dev. |
| range_max | 32-bit floating-point | Maximum in-range value. Any value greater than this is counted in num_hi and is not used in the calculation of mean & dev. |
| missing | 8-bit integer | Missing limits flags. Bit 0 (LSB) is 1 when yellow low (range_min) limit is missing; Bit 1 is high when yellow high (range_max) limit is missing; other bits unused, set to 0. |
| max_track | 32-bit integer | GeoTrack index (counting from 1) where max was found |
| max_xtrack | 32-bit integer | GeoXTrack index (counting from 1) where max was found |
| min_track | 32-bit integer | GeoTrack index (counting from 1) where min was found |
| min_xtrack | 32-bit integer | GeoXTrack index (counting from 1) where min was found |

Unlimited Engineering Struct: This type is used for engineering data fields for which there are NOT known "yellow" limits

| Field Name | Type | Explanation |
|------------|-----------------------|---|
| min | 32-bit floating-point | Minimum value field takes on in granule (not valid when num = 0) |
| max | 32-bit floating-point | Maximum value field takes on in granule (not valid when num = 0) |
| mean | 32-bit floating-point | Mean of values field takes on in granule (not valid when num = 0) |
| dev | 32-bit floating-point | Standard Deviation of values field takes on in granule (not valid when num = 0) |
| num | 32-bit integer | Count of occurrences of field in granule (not including those counted in num_bad) |
| num_bad | 32-bit integer | Count of occasions on which field takes on invalid flag value (-9999) in granule |
| max_track | 32-bit integer | GeoTrack index (counting from 1) where max was found |
| max_xtrack | 32-bit integer | GeoXTrack index (counting from 1) where max was found |
| min_track | 32-bit integer | GeoTrack index (counting from 1) where min was found |
| min_xtrack | 32-bit integer | GeoXTrack index (counting from 1) where min was found |

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A1-10. L1B AIRS Browse Subset Interface Specification

Interface Specification Version 3.0.4.0
2003-05-19

ESDT ShortName = "AIRIBCBS"

Swath Name = "L1B_AIRS_Browse_Subset"

Level = "level1B"

Footprints = 90

scanlines per scanset = 3

Dimensions

These fields define all dimensions that can be used for HDF-EOS swath fields.

The names "GeoTrack" and "GeoXTrack" have a special meaning for this document: "Cross-Track" data fields have a hidden dimension of "GeoXTrack"; "Along-Track" data fields have a hidden dimension of "GeoTrack"; "Full Swath Data Fields" have hidden dimensions of both "GeoTrack" and "GeoXTrack".

| Name | Value | Explanation |
|-----------|--------------------------|---|
| GeoXTrack | 90 | Dimension across track for footprint positions. Same as number of footprints per scanline. -- starting at the left and increasing towards the right as you look along the satellite's path |
| GeoTrack | # of scan lines in swath | Dimension along track for footprint positions. Same as number of scanlines in granule. Parallel to the satellite's path, increasing with time. (Nominally 45 for Level-2, AMSU-A, and AIRS/Vis low-rate engineering; 135 for AIRS/Vis and HSB high-rate quantities) |

Geolocation Fields

These fields appear for every footprint (GeoTrack * GeoXTrack times) and correspond to footprint center coordinates and "shutter" time.

| Name | Explanation |
|-----------|--|
| Latitude | Footprint boresight geodetic Latitude in degrees North (-90.0 ... 90.0) |
| Longitude | Footprint boresight geodetic Longitude in degrees East (-180.0 ... 180.0) |
| Time | Footprint "shutter" TAI Time: floating-point elapsed seconds since Jan 1, 1993 |

Size: 291600 bytes (0.3 MB) per 45-scanset granule

Attributes

These fields appear only once per granule

| Name | Type | Extra Dimensions | Explanation |
|-------------------|----------------|------------------|---|
| AIRS_T_200mb_chan | 32-bit integer | None | Channel index of T200mb channel used to to create the AIRS T200mb browse product |
| AIRS_O3_chan | 32-bit integer | None | Channel index of Ozone channel used to create the AIRS L1B Ozone browse product |
| AIRS_Window_chan | 32-bit integer | None | Channel index of Window channel used to create the AIRS L1B Window browse product |
| AIRS_CH4_Chanel | 32-bit integer | None | Channel index of Methane channel used to create the AIRS L1B Methane browse product |
| AIRS_H2O_Chanel | 32-bit integer | None | Channel index of H2O channel used to create the AIRS L1B H2O browse product |

Size: 20 bytes (0.0 MB) per granule

Along-Track Data Fields

These fields appear once per scanline (GeoTrack times)

| Name | Type | Extra Dimensions | Explanation |
|----------------|---------------|------------------|---|
| scan_node_type | 8-bit integer | None | 'A' for ascending, 'D' for descending, 'N' for North-Polar, 'S' for South-Polar |

Size: 135 bytes (0.0 MB) per 45-scanset granule

Full Swath Data Fields

These fields appear for every footprint of every scanline in the granule (GeoTrack * GeoXTrack times)

| Name | Type | Extra Dimensions | Explanation |
|---------|-----------------------|------------------|--|
| scanang | 32-bit floating-point | None | Scanning angle of AIRS instrument with respect to the AIRS Instrument for this footprint (-180.0 ... 180.0, negative at start of scan, 0 at nadir) |

| | | | |
|--------------|-------------------------|------|--|
| quality_flag | 32-bit unsigned integer | None | Quality Flag (TBD) |
| AIRS_T_200mb | 32-bit floating-point | None | Radiance of AIRS Temperature sounding channel at 200 mb (milliWatts/m**2/cm**-1/steradian) |
| AIRS_O3 | 32-bit floating-point | None | Radiance of AIRS ozone channel (milliWatts/m**2/cm**-1/steradian) |
| AIRS_Window | 32-bit floating-point | None | Radiance of AIRS "window" (surface) channel (milliWatts/m**2/cm**-1/steradian) |
| AIRS_CH4 | 32-bit floating-point | None | Radiance of AIRS methane channel (milliWatts/m**2/cm**-1/steradian) |
| AIRS_H2O | 32-bit floating-point | None | Radiance of AIRS water channel (milliWatts/m**2/cm**-1/steradian) |

Size: 340200 bytes (0.3 MB) per 45-scanset granule

Total File Size (plus storage for dimensions and other HDF-EOS overhead): 631955 bytes (0.6 MB) per 45-scanset granule = 151.7 MB per day

A1-11. L1B Visible/NIR Science Interface Specification

Interface Specification Version 3.0.4.0
2003-05-19

ESDT ShortName = "AIRVBRAD"

Swath Name = "L1B_VIS_Science"

Level = "level1B"

Footprints = 90

scanlines per scanset = 3

Dimensions

These fields define all dimensions that can be used for HDF-EOS swath fields.

The names "GeoTrack" and "GeoXTrack" have a special meaning for this document: "Cross-Track" data fields have a hidden dimension of "GeoXTrack"; "Along-Track" data fields have a hidden dimension of "GeoTrack"; "Full Swath Data Fields" have hidden dimensions of both "GeoTrack" and "GeoXTrack".

| Name | Value | Explanation |
|---------------------|--------------------------|---|
| GeoXTrack | 90 | Dimension across track for footprint positions. Same as number of footprints per scanline. -- starting at the left and increasing towards the right as you look along the satellite's path |
| GeoTrack | # of scan lines in swath | Dimension along track for footprint positions. Same as number of scanlines in granule. Parallel to the satellite's path, increasing with time. (Nominally 45 for Level-2, AMSU-A, and AIRS/Vis low-rate engineering; 135 for AIRS/Vis and HSB high-rate quantities) |
| SubTrack | 9 | VIS detector elements per AIRS footprint along track (9). Direction is the same as GeoTrack -- parallel to the satellite's path, increasing with time. (opposite order to detector ordering -- detector 0 is last) |
| SubXTrack | 8 | VIS samples per AIRS footprint across track (8). Direction is the same as GeoXTrack -- starting at the left and increasing towards the right as you look along the satellite's path |
| Bulb | 3 | Number of photometric calibration sources (light bulbs) that can be used as sources for photometric calibration (3) |
| GainHistory | 5 | Number of photometric gain calculations to store for use in smoothing of gain (5) |
| GeoLocationsPerSpot | 4 | Geolocations for the 4 corner pixels in the order: trailing first scanned; trailing last-scanned; leading first-scanned; leading last-scanned. Each footprint also has a central geolocation associated with the swath geolocation lat/lon/time of the footprint. |
| Channel | 4 | Dimension of channel array (Channel 1: ~0.40 micron; Ch 2: ~0.6 micron; Ch 3: ~0.8 micron; Ch 4: broadband) |

Geolocation Fields

These fields appear for every footprint (GeoTrack * GeoXTrack times) and correspond to footprint center coordinates and "shutter" time.

| Name | Explanation |
|-----------|--|
| Latitude | Footprint boresight geodetic Latitude in degrees North (-90.0 ... 90.0) |
| Longitude | Footprint boresight geodetic Longitude in degrees East (-180.0 ... 180.0) |
| Time | Footprint "shutter" TAI Time: floating-point elapsed seconds since Jan 1, 1993 |

Size: 291600 bytes (0.3 MB) per 45-scanset granule

Attributes

These fields appear only once per granule

| Name | Type | Extra Dimensions | Explanation |
|-----------------------|----------------------------|------------------|--|
| VISDarkAMSUFOVCount | 32-bit integer | None | Number of AMSU-A footprints that are uniformly dark in the level-1B VIS/NIR and are thus likely to be uniformly clear |
| VISBrightAMSUFOVCount | 32-bit integer | None | Number of AMSU-A footprints that are uniformly bright in the level-1B VIS/NIR and are thus likely to be uniformly cloudy |
| processing_level | string of 8-bit characters | None | Zero-terminated character string denoting processing level ("level1B") |
| instrument | string of 8-bit characters | None | Zero-terminated character string denoting instrument ("VIS") |
| DayNightFlag | string of 8-bit characters | None | Zero-terminated character string denoting granule as day and/or night: (Always "Day", "Night", or "Both") |

| | | | |
|-----------------|----------------------------|------|---|
| AutomaticQAFlag | string of 8-bit characters | None | Zero-terminated character string denoting granule data quality: (Always "Passed", "Failed", or "Suspect") |
| NumTotalData | 32-bit integer | None | Total number of expected scene footprints |
| NumProcessData | 32-bit integer | None | Number of scene footprints which are present and can be processed routinely (state = 0) |
| NumSpecialData | 32-bit integer | None | Number of scene footprints which are present and can be processed only as a special test (state = 1) |
| NumBadData | 32-bit integer | None | Number of scene footprints which are present but cannot be processed (state = 2) |
| NumMissingData | 32-bit integer | None | Number of expected scene footprints which are not present (state = 3) |
| NumLandSurface | 32-bit integer | None | Number of scene footprints for which the surface is more than 90% land |
| NumOceanSurface | 32-bit integer | None | Number of scene footprints for which the surface is less than 10% land |
| node_type | string of 8-bit characters | None | Zero-terminated character string denoting whether granule is ascending, descending, or pole-crossing: ("Ascending" and "Descending" for entirely ascending or entirely descending granules, or "NorthPole" or "SouthPole" for pole-crossing granules) |
| start_year | 32-bit integer | None | Year in which granule started, UTC (e.g. 1999) |
| start_month | 32-bit integer | None | Month in which granule started, UTC (1 ... 12) |
| start_day | 32-bit integer | None | Day of month in which granule started, UTC (1 ... 31) |
| start_hour | 32-bit integer | None | Hour of day in which granule started, UTC (0 ... 23) |
| start_minute | 32-bit integer | None | Minute of hour in which granule started, UTC (0 ... 59) |
| start_sec | 32-bit floating-point | None | Second of minute in which granule started, UTC (0.0 ... 59.0) |
| start_orbit | 32-bit integer | None | Orbit number of mission in which granule started |
| end_orbit | 32-bit integer | None | Orbit number of mission in which granule ended |
| orbit_path | 32-bit integer | None | Orbit path of start orbit (1 ... 233 as defined by EOS project) |
| start_orbit_row | 32-bit integer | None | Orbit row at start of granule (1 ... 248 as defined by EOS project) |
| end_orbit_row | 32-bit integer | None | Orbit row at end of granule (1 ... 248 as defined by EOS project) |
| granule_number | 32-bit integer | None | Number of granule within day (1 ... 240) |
| num_scansets | 32-bit integer | None | Number of scansets in granule (1 ... 45) |
| num_scanlines | 32-bit integer | None | Number of scanlines in granule (3 * num_scansets) |
| start_Latitude | 64-bit floating-point | None | Geodetic Latitude of spacecraft at start of granule in degrees North (-90.0 ... 90.0) |
| start_Longitude | 64-bit floating-point | None | Geodetic Longitude of spacecraft at start of granule in degrees East (-180.0 ... 180.0) |
| start_Time | 64-bit floating-point | None | TAI Time at start of granule (floating-point elapsed seconds since start of 1993) |
| end_Latitude | 64-bit floating-point | None | Geodetic Latitude of spacecraft at end of granule in degrees North (-90.0 ... 90.0) |
| end_Longitude | 64-bit floating-point | None | Geodetic Longitude of spacecraft at end of granule in degrees East (-180.0 ... 180.0) |
| end_Time | 64-bit floating-point | None | TAI Time at end of granule (floating-point elapsed seconds since start of 1993) |
| eq_x_longitude | 32-bit floating-point | None | Longitude of spacecraft at southward equator crossing nearest granule start in degrees East (-180.0 ... 180.0) |
| eq_x_tai | 64-bit floating-point | None | Time of eq_x_longitude in TAI units (floating-point elapsed seconds since start of 1993) |
| orbitgeoqa | 32-bit unsigned integer | None | Orbit Geolocation QA: bit 0 (LSB): bad input value (last scanline); bit 1: bad input value (first scanline); bit 2: PGS_EPH_GetEphMet() returned PGSEPH_E_NO_SC_EPHEM_FILE; bit 3: PGS_EPH_GetEphMet() returned PGSEPH_E_BAD_ARRAY_SIZE; bit 4: PGS_EPH_GetEphMet() returned PGSTD_E_TIME_FMT_ERROR; bit 5: PGS_EPH_GetEphMet() returned PGSTD_E_TIME_VALUE_ERROR; bit 6: PGS_EPH_GetEphMet() returned PGSTD_E_SC_TAG_UNKNOWN; bit 7: PGS_EPH_GetEphMet() returned PGS_E_TOOLKIT; bit 8: PGS_TD_UTCtoTAI() returned PGSTD_E_NO_LEAP_SECS; bit 9: PGS_TD_UTCtoTAI() returned PGSTD_E_TIME_FMT_ERROR; bit 10: PGS_TD_UTCtoTAI() returned PGSTD_E_TIME_VALUE_ERROR; bit 11: PGS_TD_UTCtoTAI() returned PGS_E_TOOLKIT; bit 12: PGS_CSC_DayNight() returned PGSTD_E_NO_LEAP_SECS; bit 13: PGS_CSC_DayNight() returned PGSCSC_E_INVALID_LIMITTAG; bit 14: PGS_CSC_DayNight() returned PGSCSC_E_BAD_ARRAY_SIZE; bit 15: PGS_CSC_DayNight() returned PGSCSC_W_ERROR_IN_DAYNIGHT; bit 16: PGS_CSC_DayNight() returned PGSCSC_W_BAD_TRANSFORM_VALUE; bit 17: PGS_CSC_DayNight() returned PGSCSC_W_REFLOW_HORIZON; bit 18: PGS_CSC_DayNight() returned |

| | | | |
|--------------------|--|--------------------------------|--|
| | | | PGSCSC_W_PREDICTED_UT1; bit 19: PGS_CSC_DayNight() returned PGSTD_E_NO_UT1_VALUE; bit 20: PGS_CSC_DayNight() returned PGSTD_E_BAD_INITIAL_TIME; bit 21: PGS_CSC_DayNight() returned PGSCBP_E_TIME_OUT_OF_RANGE; bit 22: PGS_CSC_DayNight() returned PGSCBP_E_UNABLE_TO_OPEN_FILE; bit 22: PGS_CSC_DayNight() returned PGSMEM_E_NO_MEMORY; bit 24: PGS_CSC_DayNight() returned PGS_E_TOOLKIT; bit 25-31: not used |
| num_satgeoqa | 16-bit integer | None | Number of scans with problems in satgeoqa |
| num_glintgeoqa | 16-bit integer | None | Number of scans with problems in glintgeoqa |
| num_moongeoqa | 16-bit integer | None | Number of scans with problems in moongeoqa |
| num_ftptgeoqa | 16-bit integer | None | Number of footprints with problems in ftptgeoqa |
| num_zengeoqa | 16-bit integer | None | Number of footprints with problems in zengeoqa |
| num_demgeoqa | 16-bit integer | None | Number of footprints with problems in demgeoqa |
| num_fpe | 16-bit integer | None | Number of floating point errors |
| LonGranuleCen | 16-bit integer | None | Geodetic Longitude of the center of the granule in degrees East (-180 ... 180) |
| LatGranuleCen | 16-bit integer | None | Geodetic Latitude of the center of the granule in degrees North (-90 ... 90) |
| LocTimeGranuleCen | 16-bit integer | None | Local solar time at the center of the granule in minutes past midnight (0 ... 1439) |
| VegMapFileName | string of 8-bit characters | None | Name of AVHRR input file used as Vegetation Map |
| limit_scene_counts | Color Counts (see below) | Channel (= 4) * SubTrack (= 9) | Input limit checking on scene data numbers |
| limit_bb_counts | Color Counts (see below) | Channel (= 4) * SubTrack (= 9) | Input limit checking on data numbers from the blackbody (dark target) |
| limit_phot_counts | Color Counts (see below) | Channel (= 4) * SubTrack (= 9) | Input limit checking on data numbers from the photometric calibration source (bright target) |
| limit_vis_det_temp | Color Counts (see below) | None | Input limit checking on Vis sensor array temperature |
| input_scene_counts | Limited Engineering Struct (see below) | Channel (= 4) * SubTrack (= 9) | Input statistics on scene data numbers |
| input_bb_counts | Limited Engineering Struct (see below) | Channel (= 4) * SubTrack (= 9) | Input statistics on data numbers from the blackbody (dark target) |
| input_phot_counts | Limited Engineering Struct (see below) | Channel (= 4) * SubTrack (= 9) | Input statistics on data numbers from the photometric calibration source (bright target) |
| input_vis_det_temp | Limited Engineering Struct (see below) | None | Input statistics on Vis sensor array temperature |
| limit_offsets | Color Counts (see below) | Channel (= 4) * SubTrack (= 9) | Output limit checking on offsets |
| offset_stats | Unlimited Engineering Struct (see below) | Channel (= 4) * SubTrack (= 9) | Statistics on offsets |
| offset_unc_stats | Unlimited Engineering Struct (see below) | Channel (= 4) * SubTrack (= 9) | Statistics on offset uncertainties |
| gain_scan | 16-bit unsigned integer | None | Scanline number of (first) gain calculation completed in granule. 0 for no gain calculation completed in this granule. |
| gain_TAI | 64-bit floating-point | None | TAI time of (first) gain calculation. (floating-point elapsed seconds since start of 1993) 0.0 for no gain calculation completed in this granule. |
| gain_TAI_prev | 64-bit floating-point | Bulb (= 3) * GainHistory (= 5) | TAI time of previous valid gain calculation on each bulb. (floating-point elapsed seconds since start of 1993) |
| gain_num | 16-bit integer | None | Number of gain calculations in this granule. (Should always be 0 or 1) |
| gain_bulb | 16-bit integer | None | bulb number (1, 2, or 3) of bulb used for (first) gain calculation (including gain calculations started but not completed). 0 for no gain calculation occurred in this granule. |
| bulb_failed | 8-bit integer | None | 1 if a bulb failure was detected in this granule, 0 otherwise. |
| gain | 32-bit floating-point | Channel (= 4) * | Gain: number of radiance units per count (Same as gain_prev on most recently |

| | | | |
|-------------------|--|---|--|
| | point | SubTrack (= 9) | used bulb when no gain calculation was performed in this granule) |
| gain_err | 32-bit floating-point | Channel (= 4) * SubTrack (= 9) | Error caused by imperfect fit for gain (gain units). (Same as gain_err_prev on most recently used bulb when no gain calculation was performed in this granule) |
| gain_prev | 32-bit floating-point | Bulb (= 3) * GainHistory (= 5) * Channel (= 4) * SubTrack (= 9) | Previous Gain: number of radiance units per count at time of previous gain calculations for each bulb |
| gain_err_prev | 32-bit floating-point | Bulb (= 3) * GainHistory (= 5) * Channel (= 4) * SubTrack (= 9) | gain_err for each gain_prev |
| gain_start_TAI | 64-bit floating-point | None | TAI time when photometric calibration source was turned "on" for a gain calculation that had started but had not finished collecting data at the end of the granule. (floating-point elapsed seconds since start of 1993) 0.0 for no gain calculation left partial at the end of this granule. |
| gain_num_counts | 32-bit integer | Channel (= 4) * SubTrack (= 9) | The number of data points of counts per detector collected in gain_sum_counts and gain_num_counts2 for a gain calculation that had started but had not finished collecting data at the end of the granule. 0.0 for no gain calculation left partial at the end of this granule. |
| gain_sum_counts | 64-bit floating-point | Channel (= 4) * SubTrack (= 9) | The sum of the counts per detector for a gain calculation that had started but had not finished collecting data at the end of the granule. 0.0 for no gain calculation left partial at the end of this granule. |
| gain_sum_counts2 | 64-bit floating-point | Channel (= 4) * SubTrack (= 9) | The sum of the squares of counts per detector for a gain calculation that had started but had not finished collecting data at the end of the granule. 0.0 for no gain calculation left partial at the end of this granule. |
| primary_bulb | 16-bit integer | None | Bulb number of photometric calibration source used as primary bulb (1, 2, or 3; 0 for no primary bulb) |
| secondary_bulb | 16-bit integer | None | Bulb number of photometric calibration source used as secondary bulb (1, 2, or 3; 0 for no secondary bulb) |
| backup_bulb | 16-bit integer | None | Bulb number of photometric calibration source used as backup bulb (1, 2, or 3; 0 for no backup bulb) |
| K21 | 32-bit floating-point | Channel (= 4) * SubTrack (= 9) | Gain calculated using bulb 2, divided by gain using bulb 1. (Tracks degradation of bulb 1 relative to bulb 2.) |
| K32 | 32-bit floating-point | Channel (= 4) * SubTrack (= 9) | Gain calculated using bulb 3, divided by gain using bulb 2. (Tracks degradation of bulb 2 relative to bulb 3.) |
| K31 | 32-bit floating-point | Channel (= 4) * SubTrack (= 9) | Gain calculated using bulb 3, divided by gain using bulb 1. (Tracks degradation of bulb 1 relative to bulb 3.) |
| K_factors_applied | 8-bit unsigned integer | Channel (= 4) | Flag if K factors were applied for each channel (1 for yes, 0 for no) |
| gamma_ground | 32-bit floating-point | Channel (= 4) * SubTrack (= 9) | Correction factor applied to gain calculation based on observations of known ground targets |
| gamma_MODIS | 32-bit floating-point | Channel (= 4) * SubTrack (= 9) | Correction factor applied to gain calculation based on co-located MODIS and AIRS observations |
| rad_stats | Unlimited Engineering Struct (see below) | Channel (= 4) * SubTrack (= 9) | Statistics over the granule of radiances (radiance units) |
| NeN_stats | Limited Engineering Struct (see below) | Channel (= 4) * SubTrack (= 9) | Statistics over the granule of Noise-equivalent Radiance (NeN) |
| granules_present | string of 8-bit characters | None | Zero-terminated character string denoting which adjacent granules were available for smoothing ("All" for both previous & next, "Prev" for previous but not next, "Next" for next but not previous, "None" for neither previous nor next) |
| xtrack_err | 32-bit floating-point | Channel (= 4) | cross-track pixel location error estimate per channel (km) |
| track_err | 32-bit floating-point | Channel (= 4) | Along-track pixel location error estimate per channel (km) |
| align_1_2_nadir | 32-bit floating-point | None | Expected error (km) between the pixel locations for the corner locations of near-nadir AIRS footprints (45 & 46) between VIS channels 1 & 2 |
| align_2_3_nadir | 32-bit floating-point | None | Expected error (km) between the pixel locations for the corner locations of near-nadir AIRS footprints (45 & 46) between VIS channels 2 & 3 |
| align_2_4_nadir | 32-bit floating-point | None | Expected error (km) between the pixel locations for the corner locations of near-nadir AIRS footprints (45 & 46) between VIS channels 2 & 4 |
| align_1_2_maxang | 32-bit floating-point | None | Expected error (km) between the pixel locations for the corner locations of near-limb AIRS footprints (1 & 90) between VIS channels 1 & 2 |
| align_2_3_maxang | 32-bit floating-point | None | Expected error (km) between the pixel locations for the corner locations of near- |

| | | | |
|------------------|-----------------------|------|---|
| | point | | limb AIRS footprints (1 & 90) between VIS channels 2 & 3 |
| align_2_4_maxang | 32-bit floating-point | None | Expected error (km) between the pixel locations for the corner locations of near-limb AIRS footprints (1 & 90) between VIS channels 2 & 4 |
| align_vis_airs | 32-bit floating-point | None | Expected error (km) between the pixel locations for the corner locations of near-nadir AIRS footprints (45 & 46) between the AIRS center and all VIS channels |

Size: 32792 bytes (0.0 MB) per granule

Along-Track Data Fields

These fields appear once per scanline (GeoTrack times)

| Name | Type | Extra Dimensions | Explanation |
|------------|-------------------------|-----------------------------------|--|
| offset | 32-bit floating-point | Channel (= 4) * SubTrack (= 9) | Offset: number of counts expected for no radiance at time nadirTAI |
| offset_err | 32-bit floating-point | Channel (= 4) * SubTrack (= 9) | Error caused by imperfect fit for offset (radiance units) |
| NeN | 32-bit floating-point | Channel (= 4) * SubTrack (= 9) | Noise-equivalent Radiance (radiance units) |
| satheight | 32-bit floating-point | None | Satellite altitude at nadirTAI in km above reference ellipsoid (e.g. 725.2) |
| satroll | 32-bit floating-point | None | Satellite attitude roll angle at nadirTAI (-180.0 ... 180.0 angle about the +x (roll) ORB axis, +x axis is positively oriented in the direction of orbital flight completing an orthogonal triad with y and z.) |
| satpitch | 32-bit floating-point | None | Satellite attitude pitch angle at nadirTAI (-180.0 ... 180.0 angle about +y (pitch) ORB axis. +y axis is oriented normal to the orbit plane with the positive sense opposite to that of the orbit's angular momentum vector H.) |
| satyaw | 32-bit floating-point | None | Satellite attitude yaw angle at nadirTAI (-180.0 ... 180.0 angle about +z (yaw) axis. +z axis is positively oriented earthward parallel to the satellite radius vector R from the spacecraft center of mass to the center of the Earth.) |
| satgeoqa | 32-bit unsigned integer | None | Satellite Geolocation QA flags: bit 0 (LSB): bad input value; bit 1: PGS_TD_TAtoUTC() returned PGSTD_E_NO_LEAP_SECS; bit 2: PGS_TD_TAtoUTC() returned PGS_E_TOOLKIT; bit 3: PGS_EPH_EphemAttit() returned PGSEPH_W_BAD_EPHEM_VALUE; bit 4: PGS_EPH_EphemAttit() returned PGSEPH_E_BAD_EPHEM_FILE_HDR; bit 5: PGS_EPH_EphemAttit() returned PGSEPH_E_NO_SC_EPHEM_FILE; bit 6: PGS_EPH_EphemAttit() returned PGSEPH_E_NO_DATA_REQUESTED; bit 7: PGS_EPH_EphemAttit() returned PGSTD_E_SC_TAG_UNKNOWN; bit 8: PGS_EPH_EphemAttit() returned PGSEPH_E_BAD_ARRAY_SIZE; bit 9: PGS_EPH_EphemAttit() returned PGSTD_E_TIME_FMT_ERROR; bit 10: PGS_EPH_EphemAttit() returned PGSTD_E_TIME_VALUE_ERROR; bit 11: PGS_EPH_EphemAttit() returned PGSTD_E_NO_LEAP_SECS; bit 12: PGS_EPH_EphemAttit() returned PGS_E_TOOLKIT; bit 13: PGS_CSC_ECtoECR() returned PGSCSC_W_BAD_TRANSFORM_VALUE; bit 14: PGS_CSC_ECtoECR() returned PGSCSC_E_BAD_ARRAY_SIZE; bit 15: PGS_CSC_ECtoECR() returned PGSTD_E_NO_LEAP_SECS; bit 16: PGS_CSC_ECtoECR() returned PGSTD_E_TIME_FMT_ERROR; bit 17: PGS_CSC_ECtoECR() returned PGSTD_E_TIME_VALUE_ERROR; bit 18: unused (set to zero); bit 19: PGS_CSC_ECtoECR() returned PGSTD_E_NO_UT1_VALUE; bit 20: PGS_CSC_ECtoECR() returned PGS_E_TOOLKIT; bit 21: PGS_CSC_ECRtoGEO() returned PGSCSC_W_TOO_MANY_ITERS; bit 22: PGS_CSC_ECRtoGEO() returned PGSCSC_W_INVALID_ALTITUDE; bit 23: PGS_CSC_ECRtoGEO() returned PGSCSC_W_SPHERE_BODY; bit 24: PGS_CSC_ECRtoGEO() returned PGSCSC_W_LARGE_FLATTENING; bit 25: PGS_CSC_ECRtoGEO() returned PGSCSC_W_DEFAULT_EARTH_MODEL; bit 26: PGS_CSC_ECRtoGEO() returned PGSCSC_E_BAD_EARTH_MODEL; bit 27: PGS_CSC_ECRtoGEO() returned PGS_E_TOOLKIT; bit 28-31: not used |
| glintgeoqa | 16-bit unsigned integer | None | Glint Geolocation QA flags: bit 0 (LSB): bad input value; bit 1: glint location in Earth's shadow; bit 2: glint calculation not converging; bit 3: glint location sun vs. satellite zenith mismatch; bit 4: glint location sun vs. satellite azimuth mismatch; bit 5: bad glint location; bit 6: PGS_CSC_ZenithAzimuth() returned any 'W' class return code; bit 7: PGS_CSC_ZenithAzimuth() returned any 'E' class return code; bit 8: PGS_CBP_Earth_CB_Vector() returned returned any 'W' class return code; bit 9: PGS_CBP_Earth_CB_Vector() returned returned any 'E' class return code; bit 10: PGS_CSC_ECtoECR() returned any 'W' class return code except PGSCSC_W_PREDICTED_UT1 (for Glint); bit 11: PGS_CSC_ECtoECR() returned any 'E' class return code (for Glint); bit 12: PGS_CSC_ECRtoGEO() returned any 'W' class return code (for Glint); bit 13: PGS_CSC_ECRtoGEO() returned any 'E' class return code (for Glint); bit 14: PGS_CSC_ECtoECR() returned any 'W' class return code except PGSCSC_W_PREDICTED_UT1; bit 15: PGS_CSC_ECtoECR() returned any 'E' class return code |
| moongeoqa | 16-bit unsigned integer | None | Moon Geolocation QA flags: bit 0 (LSB): bad input value; bit 1: PGS_TD_TAtoUTC() returned PGSTD_E_NO_LEAP_SECS; bit 2: PGS_TD_TAtoUTC() returned PGS_E_TOOLKIT; bit 3: PGS_CBP_Sat_CB_Vector() returned PGSCBP_W_BELOW_SURFACE; bit 4: PGS_CBP_Sat_CB_Vector() returned PGSCBP_W_BAD_CB_VECTOR; bit 5: PGS_CBP_Sat_CB_Vector() returned PGSCBP_E_BAD_ARRAY_SIZE; bit 6: PGS_CBP_Sat_CB_Vector() returned PGSCBP_E_INVALID_CB_ID; bit 7: PGS_CBP_Sat_CB_Vector() returned PGSMFM_F_NO_MEMORY; bit 8: |

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|----------------|-------------------------|------|---|
| | | | PGS_CBP_Sat_CB_Vector() returned PGSCBP_E_UNABLE_TO_OPEN_FILE; bit 9: PGS_CBP_Sat_CB_Vector() returned PGSTD_E_BAD_INITIAL_TIME; bit 10: PGS_CBP_Sat_CB_Vector() returned PGSCBP_E_TIME_OUT_OF_RANGE; bit 11: PGS_CBP_Sat_CB_Vector() returned PGSTD_E_SC_TAG_UNKNOWN; bit 12: PGS_CBP_Sat_CB_Vector() returned PGSEPH_E_BAD_EPHEM_FILE_HDR; bit 13: PGS_CBP_Sat_CB_Vector() returned PGSEPH_E_NO_SC_EPHEM_FILE; bit 14: PGS_CBP_Sat_CB_Vector() returned PGS_E_TOOLKIT; bit 15: not used |
| nadirTAI | 64-bit floating-point | None | TAI time at which instrument is nominally looking directly down. (between footprints 15 & 16 for AMSU or between footprints 45 & 46 for AIRS/Vis & HSB) (floating-point elapsed seconds since start of 1993) |
| sat_lat | 64-bit floating-point | None | Satellite geodetic latitude in degrees North (-90.0 ... 90.0) |
| sat_lon | 64-bit floating-point | None | Satellite geodetic longitude in degrees East (-180.0 ... 180.0) |
| scan_node_type | 8-bit integer | None | 'A' for ascending, 'D' for descending, 'N' for North-Polar, 'S' for South-Polar |
| glintlat | 32-bit floating-point | None | Solar glint geodetic latitude in degrees North at nadirTAI (-90.0 ... 90.0) |
| glintlon | 32-bit floating-point | None | Solar glint geodetic longitude in degrees East at nadirTAI (-180.0 ... 180.0) |
| ViSnrArrTemp | 32-bit floating-point | None | Vis/NIR Sensor Array Temperature (Celcius) |
| ScHeadTemp1 | 32-bit floating-point | None | Scanner Head Housing Temperature 1 (active A or B) (Celcius) |
| OpMode | 16-bit unsigned integer | None | Instrument Operations Mode. See AIRS Command Handbook, section 6.4 for a definition of each bit. bits 0 (LSB)-2 cal phase; bits 3-6 Cal Func; bit 7 quicklook (expedited) flag; bits 8-11 submode bits 12-14 Mode (0=standby, 1=ready, 2=operate, 3=checkout, 4=decontaminate, 5=off, 6=survival); bit 16 transition flag |

Size: 67365 bytes (0.1 MB) per 45-scanset granule

Full Swath Data Fields

These fields appear for every footprint of every scanline in the granule (GeoTrack * GeoXTrack times)

| Name | Type | Extra Dimensions | Explanation |
|--------------------|-------------------------|--|--|
| radiances | 32-bit floating-point | Channel (= 4) * SubTrack (= 9) * SubXTrack (= 8) | Radiances for each channel in Watts/m**2/micron/steradian |
| PrelimCldQA | 8-bit integer | None | Cloud QA index (0-good or 1-bad) -1 for not calculated |
| PrelimCldPrcVis | 8-bit integer | None | Cloud Percent (0...100) -1 for not calculated |
| PrelimCldPrcVisErr | 8-bit integer | None | Cloud Fraction Error (0...100) -1 for not calculated |
| PrelimClrPrcVis | 8-bit integer | None | Clear Fraction (0...100) -1 for not calculated |
| PrelimClrPrcVisErr | 8-bit integer | None | Clear Fraction Error (0...100) -1 for not calculated |
| PrelimCldMapVis | 8-bit integer | SubTrack (= 9) * SubXTrack (= 8) | Cloud Map (0-clear, 1-cloudy) -1 for not calculated |
| PrelimNDVI | 32-bit floating-point | SubTrack (= 9) * SubXTrack (= 8) | Vegetation Index (-1.0 to 1.0) -999.0 for not calculated |
| bright_index | 16-bit integer | None | Brightness index (1...5, 5 is brightest. -1 for not calculated) |
| inhomo_index | 16-bit integer | None | Inhomogeneity index (0...64, 1st digit NDVI-Dev, 2nd digit Ch1-Dev, -9999 for not calculated) |
| scanang | 32-bit floating-point | None | Scanning angle of AIRS instrument with respect to the AIRS Instrument for this footprint (-180.0 ... 180.0, negative at start of scan, 0 at nadir) |
| ftptgeoqa | 32-bit unsigned integer | None | Footprint Geolocation QA flags: bit 0 (LSB): bad input value; bit 1: PGS_TD_TAltoUTC() returned PGSTD_E_NO_LEAP_SECS; bit 2: PGS_TD_TAltoUTC() returned PGS_E_TOOLKIT; bit 3: PGS_CSC_GetFOV_Pixel() returned PGSCSC_W_MISS_EARTH; bit 4: PGS_CSC_GetFOV_Pixel() returned PGSTD_E_SC_TAG_UNKNOWN; bit 5: PGS_CSC_GetFOV_Pixel() returned PGSCSC_W_ZERO_PIXEL_VECTOR; bit 6: PGS_CSC_GetFOV_Pixel() returned PGSCSC_W_BAD_EPHEM_FOR_PIXEL; bit 7: PGS_CSC_GetFOV_Pixel() returned PGSCSC_W_INSTRUMENT_OFF_BOARD; bit 8: PGS_CSC_GetFOV_Pixel() returned PGSCSC_W_BAD_ACCURACY_FLAG; bit 9: PGS_CSC_GetFOV_Pixel() returned PGSCSC_E_BAD_ARRAY_SIZE; bit 10: PGS_CSC_GetFOV_Pixel() returned PGSCSC_W_DEFAULT_EARTH_MODEL; bit 11: PGS_CSC_GetFOV_Pixel() returned PGSCSC_W_DATA_FILE_MISSING; bit 12: PGS_CSC_GetFOV_Pixel() returned PGSCSC_E_NEG_OR_ZERO_RAD; bit 13: PGS_CSC_GetFOV_Pixel() returned PGSMEM_E_NO_MEMORY; bit 14: PGS_CSC_GetFOV_Pixel() returned PGSTD_E_NO_LEAP_SECS; bit 15: PGS_CSC_GetFOV_Pixel() returned PGSTD_E_TIME_FMT_ERROR; bit 16: PGS_CSC_GetFOV_Pixel() returned PGSTD_E_TIME_VALUE_ERROR; bit 17: PGS_CSC_GetFOV_Pixel() returned PGSCSC_W_PREDICTED_UT1; bit 18: PGS_CSC_GetFOV_Pixel() returned PGSTD_E_NO_UT1_VALUE; bit 19: PGS_CSC_GetFOV_Pixel() returned PGS_E_TOOLKIT; bit 20: PGS_CSC_GetFOV_Pixel() returned PGSEPH_E_BAD_EPHEM_FILE_HDR; bit |

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|--------------------|-------------------------|---|--|
| | | | 21: PGS_CSC_GetFOV_Pixel() returned PGSEPH_E_NO_SC_EPHEM_FILE; bit 22-31: not used |
| zengeoqa | 16-bit unsigned integer | None | Satellite zenith Geolocation QA flags: bit 0 (LSB): (Spacecraft) bad input value; bit 1: PGS_CSC_ZenithAzimuth(S/C) returned PGSCSC_W_BELOW_HORIZON; bit 2: PGS_CSC_ZenithAzimuth(S/C) returned PGSCSC_W_UNDEFINED_AZIMUTH; bit 3: PGS_CSC_ZenithAzimuth(S/C) returned PGSCSC_W_NO_REFRACTION; bit 4: PGS_CSC_ZenithAzimuth(S/C) returned PGSCSC_E_INVALID_VECTAG; bit 5: PGS_CSC_ZenithAzimuth(S/C) returned PGSCSC_E_LOOK_PT_ALTIT_RANGE; bit 6: PGS_CSC_ZenithAzimuth(S/C) returned PGSCSC_E_ZERO_INPUT_VECTOR; bit 7: PGS_CSC_ZenithAzimuth(S/C) returned PGS_E_TOOLKIT; bit 8: (Sun) bad input value; bit 9: (suppressed) PGS_CSC_ZenithAzimuth(Sun) returned PGSCSC_W_BELOW_HORIZON (This is not an error condition - the sun is below the horizon at night); bit 10: PGS_CSC_ZenithAzimuth(Sun) returned PGSCSC_W_UNDEFINED_AZIMUTH; bit 11: PGS_CSC_ZenithAzimuth(Sun) returned PGSCSC_W_NO_REFRACTION; bit 12: PGS_CSC_ZenithAzimuth(Sun) returned PGSCSC_E_INVALID_VECTAG; bit 13: PGS_CSC_ZenithAzimuth(Sun) returned PGSCSC_E_LOOK_PT_ALTIT_RANGE; bit 14: PGS_CSC_ZenithAzimuth(Sun) returned PGSCSC_E_ZERO_INPUT_VECTOR; bit 15: PGS_CSC_ZenithAzimuth(Sun) returned PGS_E_TOOLKIT |
| demgeoqa | 16-bit unsigned integer | None | Digital Elevation Model (DEM) Geolocation QA flags: bit 0 (LSB): bad input value; bit 1: Could not allocate memory; bit 2: Too close to North or South pole. Excluded; bit 3: Layer resolution incompatibility. Excluded; bit 4: Any DEM Routine (elev) returned PGSDM_E_IMPROPER_TAG; bit 5: Any DEM Routine (elev) returned PGSDM_E_CANNOT_ACCESS_DATA; bit 6: Any DEM Routine (land/water) returned PGSDM_E_IMPROPER_TAG; bit 7: Any DEM Routine (land/water) returned PGSDM_E_CANNOT_ACCESS_DATA; bit 8: Reserved for future layers; bit 9: Reserved for future layers; bit 10: PGS_DEM_GetRegion(elev) returned PGSDM_M_FILLVALUE_INCLUDED; bit 11: PGS_DEM_GetRegion(land/water) returned PGSDM_M_FILLVALUE_INCLUDED; bit 12: Reserved for future layers; bit 13: PGS_DEM_GetRegion(all) returned PGSDM_M_MULTIPLE_RESOLUTIONS; bit 14: PGS_CSC_GetFOV_Pixel() returned any 'W' class return code except PGSCSC_W_PREDICTED_UT1; bit 15: PGS_CSC_GetFOV_Pixel() returned any 'E' class return code |
| satzen | 32-bit floating-point | None | Spacecraft zenith angle (0.0 ... 180.0) degrees from zenith (measured relative to the geodetic vertical on the reference (WGS84) spheroid and including corrections outlined in EOS SDP toolkit for normal accuracy.) |
| satazi | 32-bit floating-point | None | Spacecraft azimuth angle (-180.0 ... 180.0) degrees E of N GEO) |
| solzen | 32-bit floating-point | None | Solar zenith angle (0.0 ... 180.0) degrees from zenith (measured relative to the geodetic vertical on the reference (WGS84) spheroid and including corrections outlined in EOS SDP toolkit for normal accuracy.) |
| solazi | 32-bit floating-point | None | Solar azimuth angle (-180.0 ... 180.0) degrees E of N GEO) |
| sun_glint_distance | 16-bit integer | None | Distance (km) from footprint center to location of the sun glint (-9999 for unknown, 30000 for no glint visible because spacecraft is in Earth's shadow) |
| topog | 32-bit floating-point | None | Mean topography in meters above reference ellipsoid |
| topog_err | 32-bit floating-point | None | Error estimate for topog |
| landFrac | 32-bit floating-point | None | Fraction of spot that is land (0.0 ... 1.0) |
| landFrac_err | 32-bit floating-point | None | Error estimate for landFrac |
| state | 32-bit integer | None | Data state: 0:Process, 1:Special, 2:Erroneous, 3:Missing |
| cornerlats | 32-bit floating-point | GeoLocationsPerSpot (= 4) * Channel (= 4) | Geodetic Latitudes at the centers of the pixels at the corners of the IR footprint by channel in degrees North (-90.0 ... 90.0) |
| cornerlons | 32-bit floating-point | GeoLocationsPerSpot (= 4) * Channel (= 4) | Geodetic Longitudes at the centers of the pixels at the corners of the IR footprint by channel in degrees East (-180.0 ... 180.0) |

Size: 20642850 bytes (20.6 MB) per 45-scanset granule

**Total File Size (plus storage for dimensions and other HDF-EOS overhead):
21034607 bytes (21.0 MB) per 45-scanset granule = 5048.3 MB per day**

Special AIRS Types

Limited Engineering Struct: This type is used for engineering data fields for which there are known "yellow" limits

| Field Name | Type | Explanation |
|------------|-----------------------|--|
| min | 32-bit floating-point | Minimum value field takes on in granule (not valid when num_in = 0) |
| max | 32-bit floating-point | Maximum value field takes on in granule (not valid when num_in = 0) |
| mean | 32-bit floating-point | Mean of in-range values field takes on in granule (not valid when num_in = 0) |
| dev | 32-bit floating-point | Standard Deviation of in-range values field takes on in granule (not valid when num_in = 0) |
| num_in | 32-bit integer | Count of in-range values field takes on in granule |
| num_lo | 32-bit integer | Count of out-of-range low values field takes on in granule |
| num_hi | 32-bit integer | Count of out-of-range high values field takes on in granule |
| num_bad | 32-bit integer | Count of occasions on which field takes on invalid flag value (-9999) in granule |
| range_min | 32-bit floating-point | Minimum in-range value. Any value less than this is counted in num_lo and is not used in the calculation of mean & dev. |
| range_max | 32-bit floating-point | Maximum in-range value. Any value greater than this is counted in num_hi and is not used in the calculation of mean & dev. |
| missing | 8-bit integer | Missing limits flags. Bit 0 (LSB) is 1 when yellow low (range_min) limit is missing; Bit 1 is high when yellow high (range_max) limit is missing; other bits unused, set to 0. |
| max_track | 32-bit integer | GeoTrack index (counting from 1) where max was found |
| max_xtrack | 32-bit integer | GeoXTrack index (counting from 1) where max was found |
| min_track | 32-bit integer | GeoTrack index (counting from 1) where min was found |
| min_xtrack | 32-bit integer | GeoXTrack index (counting from 1) where min was found |

Unlimited Engineering Struct: This type is used for engineering data fields for which there are NOT known "yellow" limits

| Field Name | Type | Explanation |
|------------|-----------------------|---|
| min | 32-bit floating-point | Minimum value field takes on in granule (not valid when num = 0) |
| max | 32-bit floating-point | Maximum value field takes on in granule (not valid when num = 0) |
| mean | 32-bit floating-point | Mean of values field takes on in granule (not valid when num = 0) |
| dev | 32-bit floating-point | Standard Deviation of values field takes on in granule (not valid when num = 0) |
| num | 32-bit integer | Count of occurrences of field in granule (not including those counted in num_bad) |
| num_bad | 32-bit integer | Count of occasions on which field takes on invalid flag value (-9999) in granule |
| max_track | 32-bit integer | GeoTrack index (counting from 1) where max was found |
| max_xtrack | 32-bit integer | GeoXTrack index (counting from 1) where max was found |
| min_track | 32-bit integer | GeoTrack index (counting from 1) where min was found |
| min_xtrack | 32-bit integer | GeoXTrack index (counting from 1) where min was found |

Color Counts: This type tracks counts of values received during an interval by how they compare to corresponding "red" and "yellow" limits

| Field Name | Type | Explanation |
|-----------------|-----------------------|---|
| red_lo_limit | 32-bit floating-point | Value of the low "red" limit. |
| red_lo_cnt | 32-bit integer | Count of values less than the low "red" limit. This is an "Alarm" condition. |
| to_red_lo | 32-bit integer | Count of occasions on which the "color" of this field changed from some other value to "red_low". |
| yellow_lo_limit | 32-bit floating-point | Value of the low "yellow" limit. |
| yellow_lo_cnt | 32-bit integer | Count of values greater than the low "red" limit but less than the low "yellow" limit. This is a "Warning" condition. |
| to_yellow_lo | 32-bit integer | Count of occasions on which the "color" of this field changed from some other value to "yellow_low". |
| green_cnt | 32-bit integer | Count of values greater than the low "yellow" limit but less than the high "yellow" limit. |
| to_green | 32-bit integer | Count of occasions on which the "color" of this field changed from some other value to "green". |
| yellow_hi_limit | 32-bit floating-point | Value of the high "yellow" limit. |
| yellow_hi_cnt | 32-bit integer | Count of values greater than the high "yellow" limit but less than the high "red" limit. This is a "Warning" |

| | | |
|--------------|-----------------------|--|
| | | condition. |
| to_yellow_hi | 32-bit integer | Count of occasions on which the "color" of this field changed from some other value to "yellow_high". |
| red_hi_limit | 32-bit floating-point | Value of the high "red" limit. |
| red_hi_cnt | 32-bit integer | Count of values greater than the high "red" limit. This is an "Alarm" condition. |
| to_red_hi | 32-bit integer | Count of occasions on which the "color" of this field changed from some other value to "red_high". |
| missing | 8-bit integer | Missing limits flags. Bit 0 (LSB) is 1 when yellow low limit (yellow_lo_limit) is missing; Bit 1 is high when yellow high limit is missing; Bit 2 is 1 when red low limit is missing; Bit 3 is 1 when red high limit is missing; Other bits unused set to 0. |

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A1-12. L1B Visible/NIR QA Interface Specification

Interface Specification Version 3.0.4.0
2003-05-19

ESDT ShortName = "AIRVBQAP"

Swath Name = "L1B_VIS_QA"

Level = "level1B"

Footprints = 90

scanlines per scanset = 3

Dimensions

These fields define all dimensions that can be used for HDF-EOS swath fields.

The names "GeoTrack" and "GeoXTrack" have a special meaning for this document: "Cross-Track" data fields have a hidden dimension of "GeoXTrack"; "Along-Track" data fields have a hidden dimension of "GeoTrack"; "Full Swath Data Fields" have hidden dimensions of both "GeoTrack" and "GeoXTrack".

| Name | Value | Explanation |
|---------------------|--------------------------|---|
| GeoXTrack | 90 | Dimension across track for footprint positions. Same as number of footprints per scanline. -- starting at the left and increasing towards the right as you look along the satellite's path |
| GeoTrack | # of scan lines in swath | Dimension along track for footprint positions. Same as number of scanlines in granule. Parallel to the satellite's path, increasing with time. (Nominally 45 for Level-2, AMSU-A, and AIRS/Vis low-rate engineering; 135 for AIRS/Vis and HSB high-rate quantities) |
| SubTrack | 9 | VIS detector elements per AIRS footprint along track (9). Direction is the same as GeoTrack -- parallel to the satellite's path, increasing with time. (opposite order to detector ordering -- detector 0 is last) |
| SubXTrack | 8 | VIS samples per AIRS footprint across track (8). Direction is the same as GeoXTrack -- starting at the left and increasing towards the right as you look along the satellite's path |
| Bulb | 3 | Number of photometric calibration sources (light bulbs) that can be used as sources for photometric calibration (3) |
| GainHistory | 5 | Number of photometric gain calculations to store for use in smoothing of gain (5) |
| GeoLocationsPerSpot | 4 | Geolocations for the 4 corner pixels in the order: trailing first scanned; trailing last-scanned; leading first-scanned; leading last-scanned. Each footprint also has a central geolocation associated with the swath geolocation lat/lon/time of the footprint. |
| Channel | 4 | Dimension of channel array (Channel 1: ~0.40 micron; Ch 2: ~0.6 micron; Ch 3: ~0.8 micron; Ch 4: broadband) |

Geolocation Fields

These fields appear for every footprint (GeoTrack * GeoXTrack times) and correspond to footprint center coordinates and "shutter" time.

| Name | Explanation |
|-----------|--|
| Latitude | Footprint boresight geodetic Latitude in degrees North (-90.0 ... 90.0) |
| Longitude | Footprint boresight geodetic Longitude in degrees East (-180.0 ... 180.0) |
| Time | Footprint "shutter" TAI Time: floating-point elapsed seconds since Jan 1, 1993 |

Size: 291600 bytes (0.3 MB) per 45-scanset granule

Attributes

These fields appear only once per granule

| Name | Type | Extra Dimensions | Explanation |
|------------------|----------------------------|------------------|---|
| processing_level | string of 8-bit characters | None | Zero-terminated character string denoting processing level ("level1B") |
| instrument | string of 8-bit characters | None | Zero-terminated character string denoting instrument ("VIS") |
| DayNightFlag | string of 8-bit characters | None | Zero-terminated character string denoting granule as day and/or night: (Always "Day", "Night", or "Both") |
| AutomaticQAFlag | string of 8-bit characters | None | Zero-terminated character string denoting granule data quality: (Always "Passed", "Failed", or "Suspect") |
| NumTotalData | 32-bit integer | None | Total number of expected scene footprints |

| | | | |
|-----------------|----------------------------|------|---|
| NumProcessData | 32-bit integer | None | Number of scene footprints which are present and can be processed routinely (state = 0) |
| NumSpecialData | 32-bit integer | None | Number of scene footprints which are present and can be processed only as a special test (state = 1) |
| NumBadData | 32-bit integer | None | Number of scene footprints which are present but cannot be processed (state = 2) |
| NumMissingData | 32-bit integer | None | Number of expected scene footprints which are not present (state = 3) |
| NumLandSurface | 32-bit integer | None | Number of scene footprints for which the surface is more than 90% land |
| NumOceanSurface | 32-bit integer | None | Number of scene footprints for which the surface is less than 10% land |
| node_type | string of 8-bit characters | None | Zero-terminated character string denoting whether granule is ascending, descending, or pole-crossing: ("Ascending" and "Descending" for entirely ascending or entirely descending granules, or "NorthPole" or "SouthPole" for pole-crossing granules) |
| start_year | 32-bit integer | None | Year in which granule started, UTC (e.g. 1999) |
| start_month | 32-bit integer | None | Month in which granule started, UTC (1 ... 12) |
| start_day | 32-bit integer | None | Day of month in which granule started, UTC (1 ... 31) |
| start_hour | 32-bit integer | None | Hour of day in which granule started, UTC (0 ... 23) |
| start_minute | 32-bit integer | None | Minute of hour in which granule started, UTC (0 ... 59) |
| start_sec | 32-bit floating-point | None | Second of minute in which granule started, UTC (0.0 ... 59.0) |
| start_orbit | 32-bit integer | None | Orbit number of mission in which granule started |
| end_orbit | 32-bit integer | None | Orbit number of mission in which granule ended |
| orbit_path | 32-bit integer | None | Orbit path of start orbit (1 ... 233 as defined by EOS project) |
| start_orbit_row | 32-bit integer | None | Orbit row at start of granule (1 ... 248 as defined by EOS project) |
| end_orbit_row | 32-bit integer | None | Orbit row at end of granule (1 ... 248 as defined by EOS project) |
| granule_number | 32-bit integer | None | Number of granule within day (1 ... 240) |
| num_scansets | 32-bit integer | None | Number of scansets in granule (1 ... 45) |
| num_scanlines | 32-bit integer | None | Number of scanlines in granule (3 * num_scansets) |
| start_Latitude | 64-bit floating-point | None | Geodetic Latitude of spacecraft at start of granule in degrees North (-90.0 ... 90.0) |
| start_Longitude | 64-bit floating-point | None | Geodetic Longitude of spacecraft at start of granule in degrees East (-180.0 ... 180.0) |
| start_Time | 64-bit floating-point | None | TAI Time at start of granule (floating-point elapsed seconds since start of 1993) |
| end_Latitude | 64-bit floating-point | None | Geodetic Latitude of spacecraft at end of granule in degrees North (-90.0 ... 90.0) |
| end_Longitude | 64-bit floating-point | None | Geodetic Longitude of spacecraft at end of granule in degrees East (-180.0 ... 180.0) |
| end_Time | 64-bit floating-point | None | TAI Time at end of granule (floating-point elapsed seconds since start of 1993) |
| eq_x_longitude | 32-bit floating-point | None | Longitude of spacecraft at southward equator crossing nearest granule start in degrees East (-180.0 ... 180.0) |
| eq_x_tai | 64-bit floating-point | None | Time of eq_x_longitude in TAI units (floating-point elapsed seconds since start of 1993) |
| orbitgeoqa | 32-bit unsigned integer | None | Orbit Geolocation QA: bit 0 (LSB): bad input value (last scanline); bit 1: bad input value (first scanline); bit 2: PGS_EPH_GetEphMet() returned PGSEPH_E_NO_SC_EPHEM_FILE; bit 3: PGS_EPH_GetEphMet() returned PGSEPH_E_BAD_ARRAY_SIZE; bit 4: PGS_EPH_GetEphMet() returned PGSTD_E_TIME_FMT_ERROR; bit 5: PGS_EPH_GetEphMet() returned PGSTD_E_TIME_VALUE_ERROR; bit 6: PGS_EPH_GetEphMet() returned PGSTD_E_SC_TAG_UNKNOWN; bit 7: PGS_EPH_GetEphMet() returned PGS_E_TOOLKIT; bit 8: PGS_TD_UTCtoTAI() returned PGSTD_E_NO_LEAP_SECS; bit 9: PGS_TD_UTCtoTAI() returned PGSTD_E_TIME_FMT_ERROR; bit 10: PGS_TD_UTCtoTAI() returned PGSTD_E_TIME_VALUE_ERROR; bit 11: PGS_TD_UTCtoTAI() returned PGS_E_TOOLKIT; bit 12: PGS_CSC_DayNight() returned PGSTD_E_NO_LEAP_SECS; bit 13: PGS_CSC_DayNight() returned PGSCSC_E_INVALID_LIMITTAG; bit 14: PGS_CSC_DayNight() returned PGSCSC_E_BAD_ARRAY_SIZE; bit 15: PGS_CSC_DayNight() returned PGSCSC_W_ERROR_IN_DAYNIGHT; bit 16: PGS_CSC_DayNight() returned PGSCSC_W_BAD_TRANSFORM_VALUE; bit 17: PGS_CSC_DayNight() returned PGSCSC_W_BELOW_HORIZON; bit 18: PGS_CSC_DayNight() returned PGSCSC_W_PREDICTED_UT1; bit 19: PGS_CSC_DayNight() returned PGSTD_E_NO_UT1_VALUE; bit 20: PGS_CSC_DayNight() returned PGSTD_E_BAD_INITIAL_TIME; bit 21: PGS_CSC_DayNight() returned PGSCBP_E_TIME_OUT_OF_RANGE; bit 22: PGS_CSC_DayNight() returned PGSCBP_E_UNABLE_TO_OPEN_FILE; bit 22: PGS_CSC_DayNight() returned PGSMEM_E_NO_MEMORY; bit 24: PGS_CSC_DayNight() returned PGS_E_TOOLKIT; bit 25-31: not used |

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|--------------------|--|---|---|
| num_satgeoqa | 16-bit integer | None | Number of scans with problems in satgeoqa |
| num_glintgeoqa | 16-bit integer | None | Number of scans with problems in glintgeoqa |
| num_moongoqa | 16-bit integer | None | Number of scans with problems in moongoqa |
| num_ftptgeoqa | 16-bit integer | None | Number of footprints with problems in ftptgeoqa |
| num_zengeoqa | 16-bit integer | None | Number of footprints with problems in zengeoqa |
| num_demgeoqa | 16-bit integer | None | Number of footprints with problems in demgeoqa |
| num_fpe | 16-bit integer | None | Number of floating point errors |
| LonGranuleCen | 16-bit integer | None | Geodetic Longitude of the center of the granule in degrees East (-180 ... 180) |
| LatGranuleCen | 16-bit integer | None | Geodetic Latitude of the center of the granule in degrees North (-90 ... 90) |
| LocTimeGranuleCen | 16-bit integer | None | Local solar time at the center of the granule in minutes past midnight (0 ... 1439) |
| VegMapFileName | string of 8-bit characters | None | Name of AVHRR input file used as Vegetation Map |
| limit_scene_counts | Color Counts (see below) | Channel (= 4) * SubTrack (= 9) | Input limit checking on scene data numbers |
| limit_bb_counts | Color Counts (see below) | Channel (= 4) * SubTrack (= 9) | Input limit checking on data numbers from the blackbody (dark target) |
| limit_phot_counts | Color Counts (see below) | Channel (= 4) * SubTrack (= 9) | Input limit checking on data numbers from the photometric calibration source (bright target) |
| limit_vis_det_temp | Color Counts (see below) | None | Input limit checking on Vis sensor array temperature |
| input_scene_counts | Limited Engineering Struct (see below) | Channel (= 4) * SubTrack (= 9) | Input statistics on scene data numbers |
| input_bb_counts | Limited Engineering Struct (see below) | Channel (= 4) * SubTrack (= 9) | Input statistics on data numbers from the blackbody (dark target) |
| input_phot_counts | Limited Engineering Struct (see below) | Channel (= 4) * SubTrack (= 9) | Input statistics on data numbers from the photometric calibration source (bright target) |
| input_vis_det_temp | Limited Engineering Struct (see below) | None | Input statistics on Vis sensor array temperature |
| limit_offsets | Color Counts (see below) | Channel (= 4) * SubTrack (= 9) | Output limit checking on offsets |
| offset_stats | Unlimited Engineering Struct (see below) | Channel (= 4) * SubTrack (= 9) | Statistics on offsets |
| offset_unc_stats | Unlimited Engineering Struct (see below) | Channel (= 4) * SubTrack (= 9) | Statistics on offset uncertainties |
| gain_scan | 16-bit unsigned integer | None | Scanline number of (first) gain calculation completed in granule. 0 for no gain calculation completed in this granule. |
| gain_TAI | 64-bit floating-point | None | TAI time of (first) gain calculation. (floating-point elapsed seconds since start of 1993) 0.0 for no gain calculation completed in this granule. |
| gain_TAI_prev | 64-bit floating-point | Bulb (= 3) * GainHistory (= 5) | TAI time of previous valid gain calculation on each bulb. (floating-point elapsed seconds since start of 1993) |
| gain_num | 16-bit integer | None | Number of gain calculations in this granule. (Should always be 0 or 1) |
| gain_bulb | 16-bit integer | None | bulb number (1, 2, or 3) of bulb used for (first) gain calculation (including gain calculations started but not completed). 0 for no gain calculation occurred in this granule. |
| bulb_failed | 8-bit integer | None | 1 if a bulb failure was detected in this granule, 0 otherwise. |
| gain | 32-bit floating-point | Channel (= 4) * SubTrack (= 9) | Gain: number of radiance units per count. (Same as gain_prev on most recently used bulb when no gain calculation was performed in this granule) |
| gain_err | 32-bit floating-point | Channel (= 4) * SubTrack (= 9) | Error caused by imperfect fit for gain (gain units). (Same as gain_err_prev on most recently used bulb when no gain calculation was performed in this granule) |
| gain_prev | 32-bit floating-point | Bulb (= 3) * GainHistory (= 5) * Channel (= 4) * SubTrack (= 9) | Previous Gain: number of radiance units per count at time of previous gain calculations for each bulb |

| | | | |
|-------------------|--|--|--|
| gain_err_prev | 32-bit floating-point | Bulb (= 3) * GainHistory (= 5) * Channel (= 4) * SubTrack (= 9) | gain_err for each gain_prev |
| gain_start_TAI | 64-bit floating-point | None | TAI time when photometric calibration source was turned "on" for a gain calculation that had started but had not finished collecting data at the end of the granule. (floating-point elapsed seconds since start of 1993) 0.0 for no gain calculation left partial at the end of this granule. |
| gain_num_counts | 32-bit integer | Channel (= 4) * SubTrack (= 9) | The number of data points of counts per detector collected in gain_sum_counts and gain_num_counts2 for a gain calculation that had started but had not finished collecting data at the end of the granule. 0.0 for no gain calculation left partial at the end of this granule. |
| gain_sum_counts | 64-bit floating-point | Channel (= 4) * SubTrack (= 9) | The sum of the counts per detector for a gain calculation that had started but had not finished collecting data at the end of the granule. 0.0 for no gain calculation left partial at the end of this granule. |
| gain_sum_counts2 | 64-bit floating-point | Channel (= 4) * SubTrack (= 9) | The sum of the squares of counts per detector for a gain calculation that had started but had not finished collecting data at the end of the granule. 0.0 for no gain calculation left partial at the end of this granule. |
| primary_bulb | 16-bit integer | None | Bulb number of photometric calibration source used as primary bulb (1, 2, or 3; 0 for no primary bulb) |
| secondary_bulb | 16-bit integer | None | Bulb number of photometric calibration source used as secondary bulb (1, 2, or 3; 0 for no secondary bulb) |
| backup_bulb | 16-bit integer | None | Bulb number of photometric calibration source used as backup bulb (1, 2, or 3; 0 for no backup bulb) |
| K21 | 32-bit floating-point | Channel (= 4) * SubTrack (= 9) | Gain calculated using bulb 2, divided by gain using bulb 1. (Tracks degradation of bulb 1 relative to bulb 2.) |
| K32 | 32-bit floating-point | Channel (= 4) * SubTrack (= 9) | Gain calculated using bulb 3, divided by gain using bulb 2. (Tracks degradation of bulb 2 relative to bulb 3.) |
| K31 | 32-bit floating-point | Channel (= 4) * SubTrack (= 9) | Gain calculated using bulb 3, divided by gain using bulb 1. (Tracks degradation of bulb 1 relative to bulb 3.) |
| K_factors_applied | 8-bit unsigned integer | Channel (= 4) | Flag if K factors were applied for each channel (1 for yes, 0 for no) |
| gamma_ground | 32-bit floating-point | Channel (= 4) * SubTrack (= 9) | Correction factor applied to gain calculation based on observations of known ground targets |
| gamma_MODIS | 32-bit floating-point | Channel (= 4) * SubTrack (= 9) | Correction factor applied to gain calculation based on co-located MODIS and AIRS observations |
| rad_stats | Unlimited Engineering Struct (see below) | Channel (= 4) * SubTrack (= 9) | Statistics over the granule of radiances (radiance units) |
| NeN_stats | Limited Engineering Struct (see below) | Channel (= 4) * SubTrack (= 9) | Statistics over the granule of Noise-equivalent Radiance (NeN) |
| granules_present | string of 8-bit characters | None | Zero-terminated character string denoting which adjacent granules were available for smoothing ("All" for both previous & next, "Prev" for previous but not next, "Next" for next but not previous, "None" for neither previous nor next) |
| xtrack_err | 32-bit floating-point | Channel (= 4) | cross-track pixel location error estimate per channel (km) |
| track_err | 32-bit floating-point | Channel (= 4) | Along-track pixel location error estimate per channel (km) |
| align_1_2_nadir | 32-bit floating-point | None | Expected error (km) between the pixel locations for the corner locations of near-nadir AIRS footprints (45 & 46) between VIS channels 1 & 2 |
| align_2_3_nadir | 32-bit floating-point | None | Expected error (km) between the pixel locations for the corner locations of near-nadir AIRS footprints (45 & 46) between VIS channels 2 & 3 |
| align_2_4_nadir | 32-bit floating-point | None | Expected error (km) between the pixel locations for the corner locations of near-nadir AIRS footprints (45 & 46) between VIS channels 2 & 4 |
| align_1_2_maxang | 32-bit floating-point | None | Expected error (km) between the pixel locations for the corner locations of near-limb AIRS footprints (1 & 90) between VIS channels 1 & 2 |
| align_2_3_maxang | 32-bit floating-point | None | Expected error (km) between the pixel locations for the corner locations of near-limb AIRS footprints (1 & 90) between VIS channels 2 & 3 |
| align_2_4_maxang | 32-bit floating-point | None | Expected error (km) between the pixel locations for the corner locations of near-limb AIRS footprints (1 & 90) between VIS channels 2 & 4 |
| align_vis_airs | 32-bit floating-point | None | Expected error (km) between the pixel locations for the corner locations of near-nadir AIRS footprints (45 & 46) between the AIRS center and all VIS channels |

Size: 32784 bytes (0.0 MB) per granule

Along-Track Data Fields

These fields appear once per scanline (GeoTrack times)

| Name | Type | Extra Dimensions | Explanation |
|----------------|-------------------------|------------------|--|
| satheight | 32-bit floating-point | None | Satellite altitude at nadirTAI in km above reference ellipsoid (e.g. 725.2) |
| satroll | 32-bit floating-point | None | Satellite attitude roll angle at nadirTAI (-180.0 ... 180.0 angle about the +x (roll) ORB axis, +x axis is positively oriented in the direction of orbital flight completing an orthogonal triad with y and z.) |
| satpitch | 32-bit floating-point | None | Satellite attitude pitch angle at nadirTAI (-180.0 ... 180.0 angle about +y (pitch) ORB axis. +y axis is oriented normal to the orbit plane with the positive sense opposite to that of the orbit's angular momentum vector H.) |
| satyaw | 32-bit floating-point | None | Satellite attitude yaw angle at nadirTAI (-180.0 ... 180.0 angle about +z (yaw) axis. +z axis is positively oriented earthward parallel to the satellite radius vector R from the spacecraft center of mass to the center of the Earth.) |
| satgeoqa | 32-bit unsigned integer | None | Satellite Geolocation QA flags: bit 0 (LSB): bad input value; bit 1: PGS_TD_TAItUTC() returned PGSTD_E_NO_LEAP_SECS; bit 2: PGS_TD_TAItUTC() returned PGS_E_TOOLKIT; bit 3: PGS_EPH_EphemAttit() returned PGSEPH_W_BAD_EPHEM_VALUE; bit 4: PGS_EPH_EphemAttit() returned PGSEPH_E_BAD_EPHEM_FILE_HDR; bit 5: PGS_EPH_EphemAttit() returned PGSEPH_E_NO_SC_EPHEM_FILE; bit 6: PGS_EPH_EphemAttit() returned PGSEPH_E_NO_DATA_REQUESTED; bit 7: PGS_EPH_EphemAttit() returned PGSTD_E_SC_TAG_UNKNOWN; bit 8: PGS_EPH_EphemAttit() returned PGSEPH_E_BAD_ARRAY_SIZE; bit 9: PGS_EPH_EphemAttit() returned PGSTD_E_TIME_FMT_ERROR; bit 10: PGS_EPH_EphemAttit() returned PGSTD_E_TIME_VALUE_ERROR; bit 11: PGS_EPH_EphemAttit() returned PGSTD_E_NO_LEAP_SECS; bit 12: PGS_EPH_EphemAttit() returned PGS_E_TOOLKIT; bit 13: PGS_CSC_ECIttoECR() returned PGSCSC_W_BAD_TRANSFORM_VALUE; bit 14: PGS_CSC_ECIttoECR() returned PGSCSC_E_BAD_ARRAY_SIZE; bit 15: PGS_CSC_ECIttoECR() returned PGSTD_E_NO_LEAP_SECS; bit 16: PGS_CSC_ECIttoECR() returned PGSTD_E_TIME_FMT_ERROR; bit 17: PGS_CSC_ECIttoECR() returned PGSTD_E_TIME_VALUE_ERROR; bit 18: unused (set to zero); bit 19: PGS_CSC_ECIttoECR() returned PGSTD_E_NO_UT1_VALUE; bit 20: PGS_CSC_ECIttoECR() returned PGS_E_TOOLKIT; bit 21: PGS_CSC_ECRtoGEO() returned PGSCSC_W_TOO_MANY_ITERS; bit 22: PGS_CSC_ECRtoGEO() returned PGSCSC_W_INVALID_ALTITUDE; bit 23: PGS_CSC_ECRtoGEO() returned PGSCSC_W_SPHERE_BODY; bit 24: PGS_CSC_ECRtoGEO() returned PGSCSC_W_LARGE_FLATTENING; bit 25: PGS_CSC_ECRtoGEO() returned PGSCSC_W_DEFAULT_EARTH_MODEL; bit 26: PGS_CSC_ECRtoGEO() returned PGSCSC_E_BAD_EARTH_MODEL; bit 27: PGS_CSC_ECRtoGEO() returned PGS_E_TOOLKIT; bit 28-31: not used |
| glintgeoqa | 16-bit unsigned integer | None | Glint Geolocation QA flags: bit 0 (LSB): bad input value; bit 1: glint location in Earth's shadow; bit 2: glint calculation not converging; bit 3: glint location sun vs. satellite zenith mismatch; bit 4: glint location sun vs. satellite azimuth mismatch; bit 5: bad glint location; bit 6: PGS_CSC_ZenithAzimuth() returned any 'W' class return code; bit 7: PGS_CSC_ZenithAzimuth() returned any 'E' class return code; bit 8: PGS_CBP_Earth_CB_Vector() returned returned any 'W' class return code; bit 9: PGS_CBP_Earth_CB_Vector() returned returned any 'E' class return code; bit 10: PGS_CSC_ECIttoECR() returned any 'W' class return code except PGSCSC_W_PREDICTED_UT1 (for Glint); bit 11: PGS_CSC_ECIttoECR() returned any 'E' class return code (for Glint); bit 12: PGS_CSC_ECRtoGEO() returned any 'W' class return code (for Glint); bit 13: PGS_CSC_ECRtoGEO() returned any 'E' class return code (for Glint); bit 14: PGS_CSC_ECIttoECR() returned any 'W' class return code except PGSCSC_W_PREDICTED_UT1; bit 15: PGS_CSC_ECIttoECR() returned any 'E' class return code |
| moongeoa | 16-bit unsigned integer | None | Moon Geolocation QA flags: bit 0 (LSB): bad input value; bit 1: PGS_TD_TAItUTC() returned PGSTD_E_NO_LEAP_SECS; bit 2: PGS_TD_TAItUTC() returned PGS_E_TOOLKIT; bit 3: PGS_CBP_Sat_CB_Vector() returned PGSCSC_W_BELOW_SURFACE; bit 4: PGS_CBP_Sat_CB_Vector() returned PGSCBP_W_BAD_CB_VECTOR; bit 5: PGS_CBP_Sat_CB_Vector() returned PGSCBP_E_BAD_ARRAY_SIZE; bit 6: PGS_CBP_Sat_CB_Vector() returned PGSCBP_E_INVALID_CB_ID; bit 7: PGS_CBP_Sat_CB_Vector() returned PGSMEM_E_NO_MEMORY; bit 8: PGS_CBP_Sat_CB_Vector() returned PGSCBP_E_UNABLE_TO_OPEN_FILE; bit 9: PGS_CBP_Sat_CB_Vector() returned PGSTD_E_BAD_INITIAL_TIME; bit 10: PGS_CBP_Sat_CB_Vector() returned PGSCBP_E_TIME_OUT_OF_RANGE; bit 11: PGS_CBP_Sat_CB_Vector() returned PGSTD_E_SC_TAG_UNKNOWN; bit 12: PGS_CBP_Sat_CB_Vector() returned PGSEPH_E_BAD_EPHEM_FILE_HDR; bit 13: PGS_CBP_Sat_CB_Vector() returned PGSEPH_E_NO_SC_EPHEM_FILE; bit 14: PGS_CBP_Sat_CB_Vector() returned PGS_E_TOOLKIT; bit 15: not used |
| nadirTAI | 64-bit floating-point | None | TAI time at which instrument is nominally looking directly down. (between footprints 15 & 16 for AMSU or between footprints 45 & 46 for AIRS/Vis & HSB) (floating-point elapsed seconds since start of 1993) |
| sat_lat | 64-bit floating-point | None | Satellite geodetic latitude in degrees North (-90.0 ... 90.0) |
| sat_lon | 64-bit floating-point | None | Satellite geodetic longitude in degrees East (-180.0 ... 180.0) |
| scan_node_type | 8-bit integer | None | 'A' for ascending, 'D' for descending, 'N' for North-Polar, 'S' for South-Polar |
| glintlat | 32-bit floating-point | None | Solar glint geodetic latitude in degrees North at nadirTAI (-90.0 ... 90.0) |
| glintlon | 32-bit floating-point | None | Solar glint geodetic longitude in degrees East at nadirTAI (-180.0 ... 180.0) |

| | | | |
|--------------|-------------------------|------|---|
| | point | | |
| ViSnrArrTemp | 32-bit floating-point | None | Vis/NIR Sensor Array Temperature (Celcius) |
| ScHeadTemp1 | 32-bit floating-point | None | Scanner Head Housing Temperature 1 (active A or B) (Celcius) |
| OpMode | 16-bit unsigned integer | None | Instrument Operations Mode. See AIRS Command Handbook, section 6.4 for a definition of each bit. bits 0 (LSB)-2 cal phase; bits 3-6 Cal Func; bit 7 quicklook (expedited) flag; bits 8-11 submode bits 12-14 Mode (0=standby, 1=ready, 2=operate, 3=checkout, 4=decontaminate, 5=off, 6=survival); bit 16 transition flag |

Size: 9045 bytes (0.0 MB) per 45-scanset granule

Full Swath Data Fields

These fields appear for every footprint of every scanline in the granule (GeoTrack * GeoXTrack times)

| Name | Type | Extra Dimensions | Explanation |
|-----------|-------------------------|------------------|---|
| scanang | 32-bit floating-point | None | Scanning angle of AIRS instrument with respect to the AIRS Instrument for this footprint (-180.0 ... 180.0, negative at start of scan, 0 at nadir) |
| ftptgeoqa | 32-bit unsigned integer | None | Footprint Geolocation QA flags: bit 0 (LSB): bad input value; bit 1: PGS_TD_TAItoUTC() returned PGSTD_E_NO_LEAP_SECS; bit 2: PGS_TD_TAItoUTC() returned PGS_E_TOOLKIT; bit 3: PGS_CSC_GetFOV_Pixel() returned PGSCSC_W_MISS_EARTH; bit 4: PGS_CSC_GetFOV_Pixel() returned PGSTD_E_SC_TAG_UNKNOWN; bit 5: PGS_CSC_GetFOV_Pixel() returned PGSCSC_W_ZERO_PIXEL_VECTOR; bit 6: PGS_CSC_GetFOV_Pixel() returned PGSCSC_W_BAD_EPH_FOR_PIXEL; bit 7: PGS_CSC_GetFOV_Pixel() returned PGSCSC_W_INSTRUMENT_OFF_BOARD; bit 8: PGS_CSC_GetFOV_Pixel() returned PGSCSC_W_BAD_ACCURACY_FLAG; bit 9: PGS_CSC_GetFOV_Pixel() returned PGSCSC_E_BAD_ARRAY_SIZE; bit 10: PGS_CSC_GetFOV_Pixel() returned PGSCSC_W_DEFAULT_EARTH_MODEL; bit 11: PGS_CSC_GetFOV_Pixel() returned PGSCSC_W_DATA_FILE_MISSING; bit 12: PGS_CSC_GetFOV_Pixel() returned PGSCSC_E_NEG_OR_ZERO_RAD; bit 13: PGS_CSC_GetFOV_Pixel() returned PGSMEM_E_NO_MEMORY; bit 14: PGS_CSC_GetFOV_Pixel() returned PGSTD_E_NO_LEAP_SECS; bit 15: PGS_CSC_GetFOV_Pixel() returned PGSTD_E_TIME_FMT_ERROR; bit 16: PGS_CSC_GetFOV_Pixel() returned PGSTD_E_TIME_VALUE_ERROR; bit 17: PGS_CSC_GetFOV_Pixel() returned PGSCSC_W_PREDICTED_UT1; bit 18: PGS_CSC_GetFOV_Pixel() returned PGSTD_E_NO_UT1_VALUE; bit 19: PGS_CSC_GetFOV_Pixel() returned PGS_E_TOOLKIT; bit 20: PGS_CSC_GetFOV_Pixel() returned PGSEPH_E_BAD_EPHEM_FILE_HDR; bit 21: PGS_CSC_GetFOV_Pixel() returned PGSEPH_E_NO_SC_EPHEM_FILE; bit 22-31: not used |
| zengeoqa | 16-bit unsigned integer | None | Satellite zenith Geolocation QA flags: bit 0 (LSB): (Spacecraft) bad input value; bit 1: PGS_CSC_ZenithAzimuth(S/C) returned PGSCSC_W_BELOW_HORIZON; bit 2: PGS_CSC_ZenithAzimuth(S/C) returned PGSCSC_W_UNDEFINED_AZIMUTH; bit 3: PGS_CSC_ZenithAzimuth(S/C) returned PGSCSC_W_NO_REFRACTION; bit 4: PGS_CSC_ZenithAzimuth(S/C) returned PGSCSC_E_INVALID_VECTAG; bit 5: PGS_CSC_ZenithAzimuth(S/C) returned PGSCSC_E_LOOK_PT_ALTIT_RANGE; bit 6: PGS_CSC_ZenithAzimuth(S/C) returned PGSCSC_E_ZERO_INPUT_VECTOR; bit 7: PGS_CSC_ZenithAzimuth(S/C) returned PGS_E_TOOLKIT; bit 8: (Sun) bad input value; bit 9: (suppressed) PGS_CSC_ZenithAzimuth(Sun) returned PGSCSC_W_BELOW_HORIZON (This is not an error condition - the sun is below the horizon at night); bit 10: PGS_CSC_ZenithAzimuth(Sun) returned PGSCSC_W_UNDEFINED_AZIMUTH; bit 11: PGS_CSC_ZenithAzimuth(Sun) returned PGSCSC_W_NO_REFRACTION; bit 12: PGS_CSC_ZenithAzimuth(Sun) returned PGSCSC_E_INVALID_VECTAG; bit 13: PGS_CSC_ZenithAzimuth(Sun) returned PGSCSC_E_LOOK_PT_ALTIT_RANGE; bit 14: PGS_CSC_ZenithAzimuth(Sun) returned PGSCSC_E_ZERO_INPUT_VECTOR; bit 15: PGS_CSC_ZenithAzimuth(Sun) returned PGS_E_TOOLKIT |
| demgeoqa | 16-bit unsigned integer | None | Digital Elevation Model (DEM) Geolocation QA flags: bit 0 (LSB): bad input value; bit 1: Could not allocate memory; bit 2: Too close to North or South pole. Excluded; bit 3: Layer resolution incompatibility. Excluded; bit 4: Any DEM Routine (elev) returned PGSDDEM_E_IMPROPER_TAG; bit 5: Any DEM Routine (elev) returned PGSDDEM_E_CANNOT_ACCESS_DATA; bit 6: Any DEM Routine (land/water) returned PGSDDEM_E_IMPROPER_TAG; bit 7: Any DEM Routine (land/water) returned PGSDDEM_E_CANNOT_ACCESS_DATA; bit 8: Reserved for future layers; bit 9: Reserved for future layers; bit 10: PGS_DEM_GetRegion(elev) returned PGSDDEM_M_FILLVALUE_INCLUDED; bit 11: PGS_DEM_GetRegion(land/water) returned PGSDDEM_M_FILLVALUE_INCLUDED; bit 12: Reserved for future layers; bit 13: PGS_DEM_GetRegion(all) returned PGSDDEM_M_MULTIPLE_RESOLUTIONS; bit 14: PGS_CSC_GetFOV_Pixel() returned any 'W' class return code except PGSCSC_W_PREDICTED_UT1; bit 15: PGS_CSC_GetFOV_Pixel() returned any 'E' class return code |
| satzen | 32-bit floating-point | None | Spacecraft zenith angle (0.0 ... 180.0) degrees from zenith (measured relative to the geodetic vertical on the reference (WGS84) spheroid and including corrections outlined in EOS SDP toolkit for normal accuracy.) |
| satazi | 32-bit floating-point | None | Spacecraft azimuth angle (-180.0 ... 180.0) degrees E of N GEO) |
| solzen | 32-bit floating-point | None | Solar zenith angle (0.0 ... 180.0) degrees from zenith (measured relative to the geodetic vertical on the reference (WGS84) spheroid and including corrections outlined in EOS SDP toolkit for normal accuracy.) |
| solazi | 32-bit floating-point | None | Solar azimuth angle (-180.0 ... 180.0) degrees E of N GEO) |

| | | | |
|--------------------|-----------------------|------|--|
| sun_glint_distance | 16-bit integer | None | Distance (km) from footprint center to location of the sun glint (-9999 for unknown, 30000 for no glint visible because spacecraft is in Earth's shadow) |
| topog | 32-bit floating-point | None | Mean topography in meters above reference ellipsoid |
| topog_err | 32-bit floating-point | None | Error estimate for topog |
| landFrac | 32-bit floating-point | None | Fraction of spot that is land (0.0 ... 1.0) |
| landFrac_err | 32-bit floating-point | None | Error estimate for landFrac |
| state | 32-bit integer | None | Data state: 0:Process, 1:Special, 2:Erroneous, 3:Missing |

Size: 607500 bytes (0.6 MB) per 45-scanset granule

Total File Size (plus storage for dimensions and other HDF-EOS overhead): 940929 bytes (0.9 MB) per 45-scanset granule = 225.8 MB per day

Special AIRS Types

Limited Engineering Struct: This type is used for engineering data fields for which there are known "yellow" limits

| Field Name | Type | Explanation |
|------------|-----------------------|--|
| min | 32-bit floating-point | Minimum value field takes on in granule (not valid when num_in = 0) |
| max | 32-bit floating-point | Maximum value field takes on in granule (not valid when num_in = 0) |
| mean | 32-bit floating-point | Mean of in-range values field takes on in granule (not valid when num_in = 0) |
| dev | 32-bit floating-point | Standard Deviation of in-range values field takes on in granule (not valid when num_in = 0) |
| num_in | 32-bit integer | Count of in-range values field takes on in granule |
| num_lo | 32-bit integer | Count of out-of-range low values field takes on in granule |
| num_hi | 32-bit integer | Count of out-of-range high values field takes on in granule |
| num_bad | 32-bit integer | Count of occasions on which field takes on invalid flag value (-9999) in granule |
| range_min | 32-bit floating-point | Minimum in-range value. Any value less than this is counted in num_lo and is not used in the calculation of mean & dev. |
| range_max | 32-bit floating-point | Maximum in-range value. Any value greater than this is counted in num_hi and is not used in the calculation of mean & dev. |
| missing | 8-bit integer | Missing limits flags. Bit 0 (LSB) is 1 when yellow low (range_min) limit is missing; Bit 1 is high when yellow high (range_max) limit is missing; other bits unused, set to 0. |
| max_track | 32-bit integer | GeoTrack index (counting from 1) where max was found |
| max_xtrack | 32-bit integer | GeoXTrack index (counting from 1) where max was found |
| min_track | 32-bit integer | GeoTrack index (counting from 1) where min was found |
| min_xtrack | 32-bit integer | GeoXTrack index (counting from 1) where min was found |

Unlimited Engineering Struct: This type is used for engineering data fields for which there are NOT known "yellow" limits

| Field Name | Type | Explanation |
|------------|-----------------------|---|
| min | 32-bit floating-point | Minimum value field takes on in granule (not valid when num = 0) |
| max | 32-bit floating-point | Maximum value field takes on in granule (not valid when num = 0) |
| mean | 32-bit floating-point | Mean of values field takes on in granule (not valid when num = 0) |
| dev | 32-bit floating-point | Standard Deviation of values field takes on in granule (not valid when num = 0) |
| num | 32-bit integer | Count of occurrences of field in granule (not including those counted in num_bad) |
| num_bad | 32-bit integer | Count of occasions on which field takes on invalid flag value (-9999) in granule |
| max_track | 32-bit integer | GeoTrack index (counting from 1) where max was found |
| max_xtrack | 32-bit integer | GeoXTrack index (counting from 1) where max was found |
| min_track | 32-bit integer | GeoTrack index (counting from 1) where min was found |
| min_xtrack | 32-bit integer | GeoXTrack index (counting from 1) where min was found |

Color Counts: This type tracks counts of values received during an interval by how they compare to corresponding "red" and "yellow" limits

| Field Name | Type | Explanation |
|-----------------|-----------------------|--|
| red_lo_limit | 32-bit floating-point | Value of the low "red" limit. |
| red_lo_cnt | 32-bit integer | Count of values less than the low "red" limit. This is an "Alarm" condition. |
| to_red_lo | 32-bit integer | Count of occasions on which the "color" of this field changed from some other value to "red_low". |
| yellow_lo_limit | 32-bit floating-point | Value of the low "yellow" limit. |
| yellow_lo_cnt | 32-bit integer | Count of values greater than the low "red" limit but less than the low "yellow" limit. This is a "Warning" condition. |
| to_yellow_lo | 32-bit integer | Count of occasions on which the "color" of this field changed from some other value to "yellow_low". |
| green_cnt | 32-bit integer | Count of values greater than the low "yellow" limit but less than the high "yellow" limit. |
| to_green | 32-bit integer | Count of occasions on which the "color" of this field changed from some other value to "green". |
| yellow_hi_limit | 32-bit floating-point | Value of the high "yellow" limit. |
| yellow_hi_cnt | 32-bit integer | Count of values greater than the high "yellow" limit but less than the high "red" limit. This is a "Warning" condition. |
| to_yellow_hi | 32-bit integer | Count of occasions on which the "color" of this field changed from some other value to "yellow_high". |
| red_hi_limit | 32-bit floating-point | Value of the high "red" limit. |
| red_hi_cnt | 32-bit integer | Count of values greater than the high "red" limit. This is an "Alarm" condition. |
| to_red_hi | 32-bit integer | Count of occasions on which the "color" of this field changed from some other value to "red_high". |
| missing | 8-bit integer | Missing limits flags. Bit 0 (LSB) is 1 when yellow low limit (yellow_lo_limit) is missing; Bit 1 is high when yellow high limit is missing; Bit 2 is 1 when red low limit is missing; Bit 3 is 1 when red high limit is missing; Other bits unused set to 0. |

A1-13. L1B AMSU-A Science Interface Specification

Interface Specification Version 3.0.4.0
2003-05-19

ESDT ShortName = "AIRABRAD"

Swath Name = "L1B_AMSU"

Level = "level1B"

Footprints = 30

scanlines per scanset = 1

Dimensions

These fields define all dimensions that can be used for HDF-EOS swath fields.

The names "GeoTrack" and "GeoXTrack" have a special meaning for this document: "Cross-Track" data fields have a hidden dimension of "GeoXTrack"; "Along-Track" data fields have a hidden dimension of "GeoTrack"; "Full Swath Data Fields" have hidden dimensions of both "GeoTrack" and "GeoXTrack".

| Name | Value | Explanation |
|-------------|-------------------------|--|
| GeoXTrack | 30 | Dimension across track for footprint positions. Same as number of footprints per scanline. -- starting at the left and increasing towards the right as you look along the satellite's path |
| GeoTrack | # of scanlines in swath | Dimension along track for footprint positions. Same as number of scanlines in granule. Parallel to the satellite's path, increasing with time. (Nominally 45 for Level-2, AMSU-A, and AIRS/Vis low-rate engineering; 135 for AIRS/Vis and HSB high-rate quantities) |
| Channel | 15 | Dimension of channel array (Channel 1: 23.8 GHz; Ch 2: 31.4 GHz; Ch 3: 50.3 GHz; Ch 4: 52.8 GHz; Ch 5: 53.596 +/- 0.115 GHz; Ch 6: 54.4 GHz; Ch 7: 54.94 GHz; Ch 8: 55.5 GHz; Ch 9: f0; Ch 10: f0 +/- 0.217 GHz Ch 11: f0 +/- df +/- 48 MHz; Ch 12: f0 +/- df +/- 22 MHz; Ch 13: f0 +/- df +/- 10 MHz; Ch 14: f0 +/- df +/- 4.5 MHz; Ch 15: 89 GHz (f0 = 57290.344 MHz; df = 322.4 MHz)) |
| CalXTrack | 4 | Dimension "across" track for calibration footprint positions. Same as number of calibration footprints per scanline. (NUM_FOOTPRINTS_AMSU_CALIB) (Footprints are ordered: 1-2: spaceviews; 3-4: blackbody radiometric calibration source) |
| SpaceXTrack | 2 | Dimension "across" track for spaceview calibration footprint positions in order of observation time. (NUM_FOOTPRINTS_AMSU_SPACE) |
| BBXTrack | 2 | Dimension "across" track for blackbody calibration footprint positions in order of observation time. (NUM_FOOTPRINTS_AMSU_BB) |
| WarmPRTA11 | 5 | Number of PRTs measuring AMSU-A1-1 warm target (AMSU-A1-1 is AMSU-A channels 6, 7, 9-15) |
| WarmPRTA12 | 5 | Number of PRTs measuring AMSU-A1-2 warm target (AMSU-A1-2 is AMSU-A channels 3, 4, 5, and 8) |
| WarmPRTA2 | 7 | Number of PRTs measuring AMSU-A2 warm target (AMSU-A2 is AMSU-A channels 1 & 2) |

Geolocation Fields

These fields appear for every footprint (GeoTrack * GeoXTrack times) and correspond to footprint center coordinates and "shutter" time.

| Name | Explanation |
|-----------|--|
| Latitude | Footprint boresight geodetic Latitude in degrees North (-90.0 ... 90.0) |
| Longitude | Footprint boresight geodetic Longitude in degrees East (-180.0 ... 180.0) |
| Time | Footprint "shutter" TAI Time: floating-point elapsed seconds since Jan 1, 1993 |

Size: 32400 bytes (0.0 MB) per 45-scanset granule

Attributes

These fields appear only once per granule

| Name | Type | Extra Dimensions | Explanation |
|------------------|----------------------------|------------------|---|
| processing_level | string of 8-bit characters | None | Zero-terminated character string denoting processing level ("level1B") |
| instrument | string of 8-bit characters | None | Zero-terminated character string denoting instrument ("AMSU-A") |
| DayNightFlag | string of 8-bit characters | None | Zero-terminated character string denoting granule as day and/or night: (Always "Day", "Night", or "Both") |
| AutomaticQAFlag | string of 8-bit characters | None | Zero-terminated character string denoting granule data quality: (Always "Passed", "Failed", or "Suspect") |

| | | | |
|-----------------|----------------------------|------|---|
| NumTotalData | 32-bit integer | None | Total number of expected channels * scene FOVs |
| NumProcessData | 32-bit integer | None | Number of channels * scene FOVs which are present and can be processed routinely (state = 0) |
| NumSpecialData | 32-bit integer | None | Number of channels * scene FOVs which are present and can be processed only as a special test (state = 1) |
| NumBadData | 32-bit integer | None | Number of channels * scene FOVs which are present but cannot be processed (state = 2) |
| NumMissingData | 32-bit integer | None | Number of expected channels * scene FOVs which are not present (state = 3) |
| NumLandSurface | 32-bit integer | None | Number of scene footprints for which the surface is more than 90% land |
| NumOceanSurface | 32-bit integer | None | Number of scene footprints for which the surface is less than 10% land |
| node_type | string of 8-bit characters | None | Zero-terminated character string denoting whether granule is ascending, descending, or pole-crossing: ("Ascending" and "Descending" for entirely ascending or entirely descending granules, or "NorthPole" or "SouthPole" for pole-crossing granules) |
| start_year | 32-bit integer | None | Year in which granule started, UTC (e.g. 1999) |
| start_month | 32-bit integer | None | Month in which granule started, UTC (1 ... 12) |
| start_day | 32-bit integer | None | Day of month in which granule started, UTC (1 ... 31) |
| start_hour | 32-bit integer | None | Hour of day in which granule started, UTC (0 ... 23) |
| start_minute | 32-bit integer | None | Minute of hour in which granule started, UTC (0 ... 59) |
| start_sec | 32-bit floating-point | None | Second of minute in which granule started, UTC (0.0 ... 59.0) |
| start_orbit | 32-bit integer | None | Orbit number of mission in which granule started |
| end_orbit | 32-bit integer | None | Orbit number of mission in which granule ended |
| orbit_path | 32-bit integer | None | Orbit path of start orbit (1 ... 233 as defined by EOS project) |
| start_orbit_row | 32-bit integer | None | Orbit row at start of granule (1 ... 248 as defined by EOS project) |
| end_orbit_row | 32-bit integer | None | Orbit row at end of granule (1 ... 248 as defined by EOS project) |
| granule_number | 32-bit integer | None | Number of granule within day (1 ... 240) |
| num_scansets | 32-bit integer | None | Number of scansets in granule (1 ... 45) |
| num_scanlines | 32-bit integer | None | Number of scanlines in granule (1 * num_scansets) |
| start_Latitude | 64-bit floating-point | None | Geodetic Latitude of spacecraft at start of granule in degrees North (-90.0 ... 90.0) |
| start_Longitude | 64-bit floating-point | None | Geodetic Longitude of spacecraft at start of granule in degrees East (-180.0 ... 180.0) |
| start_Time | 64-bit floating-point | None | TAI Time at start of granule (floating-point elapsed seconds since start of 1993) |
| end_Latitude | 64-bit floating-point | None | Geodetic Latitude of spacecraft at end of granule in degrees North (-90.0 ... 90.0) |
| end_Longitude | 64-bit floating-point | None | Geodetic Longitude of spacecraft at end of granule in degrees East (-180.0 ... 180.0) |
| end_Time | 64-bit floating-point | None | TAI Time at end of granule (floating-point elapsed seconds since start of 1993) |
| eq_x_longitude | 32-bit floating-point | None | Longitude of spacecraft at southward equator crossing nearest granule start in degrees East (-180.0 ... 180.0) |
| eq_x_tai | 64-bit floating-point | None | Time of eq_x_longitude in TAI units (floating-point elapsed seconds since start of 1993) |
| orbitgeoqa | 32-bit unsigned integer | None | Orbit Geolocation QA: bit 0 (LSB): bad input value (last scanline); bit 1: bad input value (first scanline); bit 2: PGS_EPH_GetEphMet() returned PGSEPH_E_NO_SC_EPHEM_FILE; bit 3: PGS_EPH_GetEphMet() returned PGSEPH_E_BAD_ARRAY_SIZE; bit 4: PGS_EPH_GetEphMet() returned PGSTD_E_TIME_FMT_ERROR; bit 5: PGS_EPH_GetEphMet() returned PGSTD_E_TIME_VALUE_ERROR; bit 6: PGS_EPH_GetEphMet() returned PGSTD_E_SC_TAG_UNKNOWN; bit 7: PGS_EPH_GetEphMet() returned PGS_E_TOOLKIT; bit 8: PGS_TD_UTCtoTAI() returned PGSTD_E_NO_LEAP_SECS; bit 9: PGS_TD_UTCtoTAI() returned PGSTD_E_TIME_FMT_ERROR; bit 10: PGS_TD_UTCtoTAI() returned PGSTD_E_TIME_VALUE_ERROR; bit 11: PGS_TD_UTCtoTAI() returned PGS_E_TOOLKIT; bit 12: PGS_CSC_DayNight() returned PGSTD_E_NO_LEAP_SECS; bit 13: PGS_CSC_DayNight() returned PGSCSC_E_INVALID_LIMITTAG; bit 14: PGS_CSC_DayNight() returned PGSCSC_E_BAD_ARRAY_SIZE; bit 15: PGS_CSC_DayNight() returned PGSCSC_W_ERROR_IN_DAYNIGHT; bit 16: PGS_CSC_DayNight() returned PGSCSC_W_BAD_TRANSFORM_VALUE; bit 17: PGS_CSC_DayNight() returned PGSCSC_W_BELOW_HORIZON; bit 18: PGS_CSC_DayNight() |

| | | | |
|--------------------------------|--|-----------------------------------|---|
| | | | returned PGSCSC_W_PREDICTED_UT1; bit 19: PGS_CSC_DayNight() returned PGSTD_E_NO_UT1_VALUE; bit 20: PGS_CSC_DayNight() returned PGSTD_E_BAD_INITIAL_TIME; bit 21: PGS_CSC_DayNight() returned PGSCBP_E_TIME_OUT_OF_RANGE; bit 22: PGS_CSC_DayNight() returned PGSCBP_E_UNABLE_TO_OPEN_FILE; bit 22: PGS_CSC_DayNight() returned PGSMEM_E_NO_MEMORY; bit 24: PGS_CSC_DayNight() returned PGS_E_TOOLKIT; bit 25-31: not used |
| num_satgeoqa | 16-bit integer | None | Number of scans with problems in satgeoqa |
| num_glintgeoqa | 16-bit integer | None | Number of scans with problems in glintgeoqa |
| num_moongeoqa | 16-bit integer | None | Number of scans with problems in moongeoqa |
| num_ftptgeoqa | 16-bit integer | None | Number of footprints with problems in ftptgeoqa |
| num_zengeoqa | 16-bit integer | None | Number of footprints with problems in zengeoqa |
| num_demgeoqa | 16-bit integer | None | Number of footprints with problems in demgeoqa |
| num_fpe | 16-bit integer | None | Number of floating point errors |
| LonGranuleCen | 16-bit integer | None | Geodetic Longitude of the center of the granule in degrees East (-180 ... 180) |
| LatGranuleCen | 16-bit integer | None | Geodetic Latitude of the center of the granule in degrees North (-90 ... 90) |
| LocTimeGranuleCen | 16-bit integer | None | Local solar time at the center of the granule in minutes past midnight (0 ... 1439) |
| center_freq | 32-bit floating-point | Channel (= 15) | Channel Center frequency (GHz) |
| IF_offset_1 | 32-bit floating-point | Channel (= 15) | Offset of first intermediate frequency stage (MHz) (zero for no mixing) |
| IF_offset_2 | 32-bit floating-point | Channel (= 15) | Offset of second intermediate frequency stage (MHz) (zero for no second mixing) |
| bandwidth | 32-bit floating-point | Channel (= 15) | bandwidth of sum of 1, 2, or 4 channels (MHz) |
| num_scanlines_not_norm_mode_a1 | 32-bit integer | None | Number of scanlines not in Process state (AMSU-A1) (AMSU-A1 is AMSU-A channels 3-15) |
| num_scanlines_not_norm_mode_a2 | 32-bit integer | None | Number of scanlines not in Process state (AMSU-A2) (AMSU-A2 is AMSU-A channels 1 and 2) |
| num_calibrated_scanlines | 32-bit integer | Channel (= 15) | Number of scanlines that had calibration coefs applied |
| num_missing_scanlines_a1 | 32-bit integer | None | Number of scanlines with state = missing (AMSU-A1) (AMSU-A1 is AMSU-A channels 3-15) |
| num_missing_scanlines_a2 | 32-bit integer | None | Number of scanlines with state = missing (AMSU-A2) (AMSU-A2 is AMSU-A channels 1 and 2) |
| num_data_gaps_a1 | 32-bit integer | None | Number of blocks of scanlines where State is not Process (AMSU-A1) (AMSU-A1 is AMSU-A channels 3-15) |
| num_data_gaps_a2 | 32-bit integer | None | Number of blocks of scanlines where State is not Process (AMSU-A2) (AMSU-A2 is AMSU-A channels 1 and 2) |
| num_instr_mode_changes_a1 | 32-bit integer | None | Number of operational instrument mode changes (AMSU-A1) (AMSU-A1 is AMSU-A channels 3-15) |
| num_instr_mode_changes_a2 | 32-bit integer | None | Number of operational instrument mode changes (AMSU-A2) (AMSU-A2 is AMSU-A channels 1 and 2) |
| num_scanlines_rec_cal_prob_a11 | 32-bit integer | None | Number of scanlines with non-zero qa_receiver (AMSU-A1-1) (AMSU-A1-1 is AMSU-A channels 6, 7, 9-15) |
| num_scanlines_rec_cal_prob_a12 | 32-bit integer | None | Number of scanlines with non-zero qa_receiver (AMSU-A1-2) (AMSU-A1-2 is AMSU-A channels 3, 4, 5, and 8) |
| num_scanlines_rec_cal_prob_a2 | 32-bit integer | None | Number of scanlines with non-zero qa_receiver (AMSU-A2) (AMSU-A2 is AMSU-A channels 1 and 2) |
| num_scanlines_ch_cal_problems | 32-bit integer | Channel (= 15) | Number of scanlines with non-zero qa_channel |
| num_scanlines_sig_coast_xing | 32-bit integer | None | Number of scanlines with qa_scanline coast crossing bit set |
| num_scanlines_sig_sun_glint | 32-bit integer | None | Number of scanlines with qa_scanline sun glint bit set |
| MoonInViewMWCount | 32-bit integer | None | Number of scanlines in granule with the moon in the AMSU-A1 space view plus number of scanlines in granule with the moon in the AMSU-A2 space view (0-90) |
| QA_unfiltered_scene_count | Unlimited Engineering Struct (see below) | GeoXTrack (= 30) * Channel (= 15) | Per footprint position raw scene count summary QA |
| QA_unfiltered_BB_count | Unlimited Engineering Struct (see below) | BBXTrack (= 2) * Channel (= 15) | Per BB footprint position raw warm count summary QA (unfiltered) |

| | | | |
|---------------------------|--|------------------------------------|---|
| QA_unfiltered_space_count | Unlimited Engineering Struct (see below) | SpaceXTrack (= 2) * Channel (= 15) | Per space footprint position raw cold count summary QA (unfiltered) |
| QA_bb_PRT_a11 | Limited Engineering Struct (see below) | None | Blackbody PRT temperature summary QA (AMSU-A1-1) (AMSU-A1-1 is AMSU-A channels 6, 7, 9-15) (C) |
| QA_bb_PRT_a12 | Limited Engineering Struct (see below) | None | Blackbody PRT temperature summary QA (AMSU-A1-2) (AMSU-A1-2 is AMSU-A channels 3, 4, 5, and 8) (C) |
| QA_bb_PRT_a2 | Limited Engineering Struct (see below) | None | Blackbody PRT temperature summary QA (AMSU-A2) (AMSU-A2 is AMSU-A channels 1 and 2) (C) |
| QA_rec_PRT_a11 | Limited Engineering Struct (see below) | None | Receiver PRT temperature summary QA (AMSU-A1-1) (AMSU-A1-1 is AMSU-A channels 6, 7, 9-15) (C) |
| QA_rec_PRT_a12 | Limited Engineering Struct (see below) | None | Receiver PRT temperature summary QA (AMSU-A1-2) (AMSU-A1-2 is AMSU-A channels 3, 4, 5, and 8) (C) |
| QA_rec_PRT_a2 | Limited Engineering Struct (see below) | None | Receiver PRT temperature summary QA (AMSU-A2) (AMSU-A2 is AMSU-A channels 1 and 2) (C) |
| QA_cal_coef_a0 | Unlimited Engineering Struct (see below) | Channel (= 15) | Calibration coefficient a0 summary QA (K) |
| QA_cal_coef_a1 | Unlimited Engineering Struct (see below) | Channel (= 15) | Calibration coefficient a1 summary QA (K/count) |
| QA_cal_coef_a2 | Unlimited Engineering Struct (see below) | Channel (= 15) | Calibration coefficient a2 summary QA (K/count**2) |
| QA_bb_raw_noise_counts | Unlimited Engineering Struct (see below) | Channel (= 15) | Summary QA on differences between warm cal counts |
| QA_sv_raw_noise_counts | Unlimited Engineering Struct (see below) | Channel (= 15) | Summary QA on differences between cold cal counts |
| QA_NeDT | Unlimited Engineering Struct (see below) | Channel (= 15) | Summary QA on gain * differences between warm cal counts (K) |
| QA_NeDT2NomRatio | Unlimited Engineering Struct (see below) | Channel (= 15) | Summary QA on gain * differences between warm cal counts over nominal NeDT (unitless) |
| granules_present | string of 8-bit characters | None | Zero-terminated character string denoting which adjacent granules were available for smoothing ("All" for both previous & next, "Prev" for previous but not next, "Next" for next but not previous, "None" for neither previous nor next) |

Size: 35510 bytes (0.0 MB) per granule

Along-Track Data Fields

These fields appear once per scanline (GeoTrack times)

| Name | Type | Extra Dimensions | Explanation |
|-----------|-----------------------|------------------|---|
| satheight | 32-bit floating-point | None | Satellite altitude at nadirTAI in km above reference ellipsoid (e.g. 725.2) |
| satroll | 32-bit floating-point | None | Satellite attitude roll angle at nadirTAI (-180.0 ... 180.0 angle about the +x (roll) ORB axis, +x axis is positively oriented in the direction of orbital flight completing an orthogonal triad with y and z.) |
| satpitch | 32-bit floating-point | None | Satellite attitude pitch angle at nadirTAI (-180.0 ... 180.0 angle about +y (pitch) ORB axis. +v axis is oriented normal to the orbit plane with the positive sense opposite to that of |

| | | | |
|----------------|-------------------------|----------------|--|
| | | | the orbit's angular momentum vector H.) |
| satyaw | 32-bit floating-point | None | Satellite attitude yaw angle at nadirTAI (-180.0 ... 180.0 angle about +z (yaw) axis. +z axis is positively oriented earthward parallel to the satellite radius vector R from the spacecraft center of mass to the center of the Earth.) |
| satgeoqa | 32-bit unsigned integer | None | Satellite Geolocation QA flags: bit 0 (LSB): bad input value; bit 1: PGS_TD_TAItUTC() returned PGSTD_E_NO_LEAP_SECS; bit 2: PGS_TD_TAItUTC() returned PGS_E_TOOLKIT; bit 3: PGS_EPH_EphemAttit() returned PGSEPH_W_BAD_EPHEM_VALUE; bit 4: PGS_EPH_EphemAttit() returned PGSEPH_E_BAD_EPHEM_FILE_HDR; bit 5: PGS_EPH_EphemAttit() returned PGSEPH_E_NO_SC_EPHEM_FILE; bit 6: PGS_EPH_EphemAttit() returned PGSEPH_E_NO_DATA_REQUESTED; bit 7: PGS_EPH_EphemAttit() returned PGSTD_E_SC_TAG_UNKNOWN; bit 8: PGS_EPH_EphemAttit() returned PGSEPH_E_BAD_ARRAY_SIZE; bit 9: PGS_EPH_EphemAttit() returned PGSTD_E_TIME_FMT_ERROR; bit 10: PGS_EPH_EphemAttit() returned PGSTD_E_TIME_VALUE_ERROR; bit 11: PGS_EPH_EphemAttit() returned PGSTD_E_NO_LEAP_SECS; bit 12: PGS_EPH_EphemAttit() returned PGS_E_TOOLKIT; bit 13: PGS_CSC_ECItECR() returned PGSCSC_W_BAD_TRANSFORM_VALUE; bit 14: PGS_CSC_ECItECR() returned PGSCSC_E_BAD_ARRAY_SIZE; bit 15: PGS_CSC_ECItECR() returned PGSTD_E_NO_LEAP_SECS; bit 16: PGS_CSC_ECItECR() returned PGSTD_E_TIME_FMT_ERROR; bit 17: PGS_CSC_ECItECR() returned PGSTD_E_TIME_VALUE_ERROR; bit 18: unused (set to zero); bit 19: PGS_CSC_ECItECR() returned PGSTD_E_NO_UT1_VALUE; bit 20: PGS_CSC_ECItECR() returned PGS_E_TOOLKIT; bit 21: PGS_CSC_ECRtoGEO() returned PGSCSC_W_TOO_MANY_ITERS; bit 22: PGS_CSC_ECRtoGEO() returned PGSCSC_W_INVALID_ALTITUDE; bit 23: PGS_CSC_ECRtoGEO() returned PGSCSC_W_SPHERE_BODY; bit 24: PGS_CSC_ECRtoGEO() returned PGSCSC_W_LARGE_FLATTENING; bit 25: PGS_CSC_ECRtoGEO() returned PGSCSC_W_DEFAULT_EARTH_MODEL; bit 26: PGS_CSC_ECRtoGEO() returned PGSCSC_E_BAD_EARTH_MODEL; bit 27: PGS_CSC_ECRtoGEO() returned PGS_E_TOOLKIT; bit 28-31: not used |
| glintgeoqa | 16-bit unsigned integer | None | Glint Geolocation QA flags: bit 0 (LSB): bad input value; bit 1: glint location in Earth's shadow; bit 2: glint calculation not converging; bit 3: glint location sun vs. satellite zenith mismatch; bit 4: glint location sun vs. satellite azimuth mismatch; bit 5: bad glint location; bit 6: PGS_CSC_ZenithAzimuth() returned any 'W' class return code; bit 7: PGS_CSC_ZenithAzimuth() returned any 'E' class return code; bit 8: PGS_CBP_Earth_CB_Vector() returned any 'W' class return code; bit 9: PGS_CBP_Earth_CB_Vector() returned any 'E' class return code; bit 10: PGS_CSC_ECItECR() returned any 'W' class return code except PGSCSC_W_PREDICTED_UT1 (for Glint); bit 11: PGS_CSC_ECItECR() returned any 'E' class return code (for Glint); bit 12: PGS_CSC_ECRtoGEO() returned any 'W' class return code (for Glint); bit 13: PGS_CSC_ECRtoGEO() returned any 'E' class return code (for Glint); bit 14: PGS_CSC_ECItECR() returned any 'W' class return code except PGSCSC_W_PREDICTED_UT1; bit 15: PGS_CSC_ECItECR() returned any 'E' class return code |
| moongeoqa | 16-bit unsigned integer | None | Moon Geolocation QA flags: bit 0 (LSB): bad input value; bit 1: PGS_TD_TAItUTC() returned PGSTD_E_NO_LEAP_SECS; bit 2: PGS_TD_TAItUTC() returned PGS_E_TOOLKIT; bit 3: PGS_CBP_Sat_CB_Vector() returned PGSCSC_W_BELOW_SURFACE; bit 4: PGS_CBP_Sat_CB_Vector() returned PGSCBP_W_BAD_CB_VECTOR; bit 5: PGS_CBP_Sat_CB_Vector() returned PGSCBP_E_BAD_ARRAY_SIZE; bit 6: PGS_CBP_Sat_CB_Vector() returned PGSCBP_E_INVALID_CB_ID; bit 7: PGS_CBP_Sat_CB_Vector() returned PGSMEM_E_NO_MEMORY; bit 8: PGS_CBP_Sat_CB_Vector() returned PGSCBP_E_UNABLE_TO_OPEN_FILE; bit 9: PGS_CBP_Sat_CB_Vector() returned PGSTD_E_BAD_INITIAL_TIME; bit 10: PGS_CBP_Sat_CB_Vector() returned PGSCBP_E_TIME_OUT_OF_RANGE; bit 11: PGS_CBP_Sat_CB_Vector() returned PGSTD_E_SC_TAG_UNKNOWN; bit 12: PGS_CBP_Sat_CB_Vector() returned PGSEPH_E_BAD_EPHEM_FILE_HDR; bit 13: PGS_CBP_Sat_CB_Vector() returned PGSEPH_E_NO_SC_EPHEM_FILE; bit 14: PGS_CBP_Sat_CB_Vector() returned PGS_E_TOOLKIT; bit 15: not used |
| nadirTAI | 64-bit floating-point | None | TAI time at which instrument is nominally looking directly down. (between footprints 15 & 16 for AMSU or between footprints 45 & 46 for AIRS/Vis & HSB) (floating-point elapsed seconds since start of 1993) |
| sat_lat | 64-bit floating-point | None | Satellite geodetic latitude in degrees North (-90.0 ... 90.0) |
| sat_lon | 64-bit floating-point | None | Satellite geodetic longitude in degrees East (-180.0 ... 180.0) |
| scan_node_type | 8-bit integer | None | 'A' for ascending, 'D' for descending, 'N' for North-Polar, 'S' for South-Polar |
| glintlat | 32-bit floating-point | None | Solar glint geodetic latitude in degrees North at nadirTAI (-90.0 ... 90.0) |
| glintlon | 32-bit floating-point | None | Solar glint geodetic longitude in degrees East at nadirTAI (-180.0 ... 180.0) |
| state1 | 32-bit integer | None | Data state for AMSU-A1: 0:Process, 1:Special, 2:Erroneous, 3:Missing |
| state2 | 32-bit integer | None | Data state for AMSU-A2: 0:Process, 1:Special, 2:Erroneous, 3:Missing (AMSU-A2 is AMSU-A channels 1 and 2) |
| cal_coef_a0 | 32-bit floating-point | Channel (= 15) | Calibration coefficients to convert raw counts to antenna temperature (K) |
| cal_coef_a1 | 32-bit floating-point | Channel (= 15) | Calibration coefficients to convert raw counts to antenna temperature (K/count) |

| | | | |
|-----------------------|------------------------|----------------|---|
| cal_coef_a2 | 32-bit floating-point | Channel (= 15) | Calibration coefficients to convert raw counts to antenna temperature (K/count**2) |
| cal_coef_a0_err | 32-bit floating-point | Channel (= 15) | Error estimate for cal_coef_a0 (K) |
| cal_coef_a1_err | 32-bit floating-point | Channel (= 15) | Error estimate for cal_coef_a1 (K/count) |
| cal_coef_a2_err | 32-bit floating-point | Channel (= 15) | Error estimate for cal_coef_a2 (K/count**2) |
| a1_ColdCalPstion | 8-bit integer | None | AMSU-A1 Cold Calibration Position 1-4 (Binary 0-3) |
| a2_ColdCalPstion | 8-bit integer | None | AMSU-A2 Cold Calibration Position 1-4 (Binary 0-3) (AMSU-A2 is AMSU-A channels 1 and 2) |
| a1_PLO_Redundncy | 8-bit integer | None | AMSU-A1 PLO Redundancy, 1: default (PLO 2); 0: redundant (PLO 1) |
| a11_mux_temp_used | 8-bit integer | None | AMSU-A1-1 MUX Temperature use flag. (1: used MUX temperature for AMSU-A1 receiver temperature; 0: used RF shelf temperature) (AMSU-A1-1 is AMSU-A channels 6, 7, 9-15) |
| a11_receiver_temp | 32-bit floating-point | None | AMSU-A1-1 receiver temperature used in calibration (MUX temperature or RF shelf temperature as specified by a11_mux_temp_used) (AMSU-A1-1 is AMSU-A channels 6, 7, 9-15) (C) |
| a11_target_temp | 32-bit floating-point | None | AMSU-A1-1 target temperature used in calibration (AMSU-A1-1 is AMSU-A channels 6, 7, 9-15) (C) |
| a12_mux_temp_used | 8-bit integer | None | AMSU-A1-2 MUX Temperature use flag. (1: used MUX temperature for AMSU-A1 receiver temperature; 0: used RF shelf temperature) (AMSU-A1-2 is AMSU-A channels 3, 4, 5, and 8) |
| a12_receiver_temp | 32-bit floating-point | None | AMSU-A1-2 receiver temperature used in calibration (MUX temperature or RF shelf temperature as specified by a12_mux_temp_used) (AMSU-A1-2 is AMSU-A channels 3, 4, 5, and 8) (C) |
| a12_target_temp | 32-bit floating-point | None | AMSU-A1-2 target temperature used in calibration (AMSU-A1-2 is AMSU-A channels 3, 4, 5, and 8) (C) |
| a2_diplexer_temp_used | 8-bit integer | None | AMSU-A2 diplexer Temperature use flag. (1: used diplexer temperature for AMSU-A2 receiver temperature; 0: used RF shelf temperature) (AMSU-A2 is AMSU-A channels 1 and 2) |
| a2_receiver_temp | 32-bit floating-point | None | AMSU-A2 receiver temperature used in calibration (diplexer temperature or RF shelf temperature as specified by a2_mux_temp_used) (AMSU-A2 is AMSU-A channels 1 and 2) (C) |
| a2_target_temp | 32-bit floating-point | None | AMSU-A2 target temperature used in calibration (AMSU-A2 is AMSU-A channels 1 and 2) (C) |
| qa_scanline | 8-bit unsigned integer | None | Scanline bitmap for AMSU-A: Bit 0: Sun glint in this scanline; Bit 1: Coastal crossing in this scanline; Bit 2: Some channels had excessive NeDT estimate; Bit 3: Near sidelobe correction applied |
| qa_receiver_a11 | 8-bit unsigned integer | None | Receiver bitmap for AMSU-A1-1 (AMSU-A1-1 is AMSU-A channels 6, 7, 9-15): Bit 0: Calibration was not derived, due to the instrument mode; Bit 1: Calibration was not derived, due to bad or missing PRT values; Bit 2: This scanline was calibrated, but the moon was in the space view; Bit 3: This scanline was calibrated, but there was a space view scan position error; Bit 4: This scanline was calibrated, but there was a blackbody scan position error; Bit 5: This scanline was calibrated, but some PRT values were bad or marginal; Bit 6: This scanline was calibrated, but there was a data gap; Bit 7: Some channels were not calibrated |
| qa_receiver_a12 | 8-bit unsigned integer | None | Receiver bitmap for AMSU-A1-2: Same fields as defined for qa_receiver_a11 |
| qa_receiver_a2 | 8-bit unsigned integer | None | Receiver bitmap for AMSU-A2: Same fields as defined for qa_receiver_a11 |
| qa_channel | 8-bit unsigned integer | Channel (= 15) | Channel bitmap for AMSU-A: Bit 0: All space view counts were bad for this channel and scanline; Bit 1: Space view counts were marginal for this channel and scanline; Bit 2: Space view counts could not be smoothed; Bit 3: All blackbody counts were bad for this channel and scanline; Bit 4: Blackbody counts were marginal for this channel and scanline; Bit 5: Blackbody counts could not be smoothed; Bit 6: Unable to calculate calibration coefficients for this scanline, most recent valid coefficients used instead; Bit 7: Excessive NeDT estimated |

Size: 21330 bytes (0.0 MB) per 45-scanset granule

Full Swath Data Fields

These fields appear for every footprint of every scanline in the granule (GeoTrack * GeoXTrack times)

| Name | Type | Extra Dimensions | Explanation |
|-----------|-------------------------|------------------|--|
| scanang | 32-bit floating-point | None | Scanning angle of AMSU-A instrument with respect to the AMSU-A Instrument for this footprint (-180.0 ... 180.0, negative at start of scan, 0 at nadir) |
| ftptgeoqa | 32-bit unsigned integer | None | Footprint Geolocation QA flags: bit 0 (LSB): bad input value; bit 1: PGS_TD_TAtoUTC() returned PGSTD_E_NO_LEAP_SECS; bit 2: PGS_TD_TAtoUTC() returned PGS_E_TOOLKIT; bit 3: PGS_CSC_GetFOV_Pixel() returned PGSCSC_W_MISS_EARTH; bit 4: PGS_CSC_GetFOV_Pixel() returned PGSTD_F_SC_TAG_UNKNOWN; bit 5: |

| | | | |
|---------------------|-------------------------|----------------|--|
| | | | PGS_CSC_GetFOV_Pixel() returned PGSCSC_W_ZERO_PIXEL_VECTOR; bit 6: PGS_CSC_GetFOV_Pixel() returned PGSCSC_W_BAD_EPH_FOR_PIXEL; bit 7: PGS_CSC_GetFOV_Pixel() returned PGSCSC_W_INSTRUMENT_OFF_BOARD; bit 8: PGS_CSC_GetFOV_Pixel() returned PGSCSC_W_BAD_ACCURACY_FLAG; bit 9: PGS_CSC_GetFOV_Pixel() returned PGSCSC_E_BAD_ARRAY_SIZE; bit 10: PGS_CSC_GetFOV_Pixel() returned PGSCSC_W_DEFAULT_EARTH_MODEL; bit 11: PGS_CSC_GetFOV_Pixel() returned PGSCSC_W_DATA_FILE_MISSING; bit 12: PGS_CSC_GetFOV_Pixel() returned PGSCSC_E_NEG_OR_ZERO_RAD; bit 13: PGS_CSC_GetFOV_Pixel() returned PGSMEM_E_NO_MEMORY; bit 14: PGS_CSC_GetFOV_Pixel() returned PGSTD_E_NO_LEAP_SECS; bit 15: PGS_CSC_GetFOV_Pixel() returned PGSTD_E_TIME_FMT_ERROR; bit 16: PGS_CSC_GetFOV_Pixel() returned PGSTD_E_TIME_VALUE_ERROR; bit 17: PGS_CSC_GetFOV_Pixel() returned PGSCSC_W_PREDICTED_UT1; bit 18: PGS_CSC_GetFOV_Pixel() returned PGSTD_E_NO_UT1_VALUE; bit 19: PGS_CSC_GetFOV_Pixel() returned PGS_E_TOOLKIT; bit 20: PGS_CSC_GetFOV_Pixel() returned PGSEPH_E_BAD_EPHEM_FILE_HDR; bit 21: PGS_CSC_GetFOV_Pixel() returned PGSEPH_E_NO_SC_EPHEM_FILE; bit 22-31: not used |
| zengeoqa | 16-bit unsigned integer | None | Satellite zenith Geolocation QA flags: bit 0 (LSB): (Spacecraft) bad input value; bit 1: PGS_CSC_ZenithAzimuth(S/C) returned PGSCSC_W_BELOW_HORIZON; bit 2: PGS_CSC_ZenithAzimuth(S/C) returned PGSCSC_W_UNDEFINED_AZIMUTH; bit 3: PGS_CSC_ZenithAzimuth(S/C) returned PGSCSC_W_NO_REFRACTION; bit 4: PGS_CSC_ZenithAzimuth(S/C) returned PGSCSC_E_INVALID_VECTAG; bit 5: PGS_CSC_ZenithAzimuth(S/C) returned PGSCSC_E_LOOK_PT_ALTIT_RANGE; bit 6: PGS_CSC_ZenithAzimuth(S/C) returned PGSCSC_E_ZERO_INPUT_VECTOR; bit 7: PGS_CSC_ZenithAzimuth(S/C) returned PGS_E_TOOLKIT; bit 8: (Sun) bad input value; bit 9: (suppressed) PGS_CSC_ZenithAzimuth(Sun) returned PGSCSC_W_BELOW_HORIZON (This is not an error condition - the sun is below the horizon at night); bit 10: PGS_CSC_ZenithAzimuth(Sun) returned PGSCSC_W_UNDEFINED_AZIMUTH; bit 11: PGS_CSC_ZenithAzimuth(Sun) returned PGSCSC_W_NO_REFRACTION; bit 12: PGS_CSC_ZenithAzimuth(Sun) returned PGSCSC_E_INVALID_VECTAG; bit 13: PGS_CSC_ZenithAzimuth(Sun) returned PGSCSC_E_LOOK_PT_ALTIT_RANGE; bit 14: PGS_CSC_ZenithAzimuth(Sun) returned PGSCSC_E_ZERO_INPUT_VECTOR; bit 15: PGS_CSC_ZenithAzimuth(Sun) returned PGS_E_TOOLKIT |
| demgeoqa | 16-bit unsigned integer | None | Digital Elevation Model (DEM) Geolocation QA flags: bit 0 (LSB): bad input value; bit 1: Could not allocate memory; bit 2: Too close to North or South pole. Excluded; bit 3: Layer resolution incompatibility. Excluded; bit 4: Any DEM Routine (elev) returned PGSDDEM_E_IMPROPER_TAG; bit 5: Any DEM Routine (elev) returned PGSDDEM_E_CANNOT_ACCESS_DATA; bit 6: Any DEM Routine (land/water) returned PGSDDEM_E_IMPROPER_TAG; bit 7: Any DEM Routine (land/water) returned PGSDDEM_E_CANNOT_ACCESS_DATA; bit 8: Reserved for future layers; bit 9: Reserved for future layers; bit 10: PGS_DEM_GetRegion(elev) returned PGSDDEM_M_FILLVALUE_INCLUDED; bit 11: PGS_DEM_GetRegion(land/water) returned PGSDDEM_M_FILLVALUE_INCLUDED; bit 12: Reserved for future layers; bit 13: PGS_DEM_GetRegion(all) returned PGSDDEM_M_MULTIPLE_RESOLUTIONS; bit 14: PGS_CSC_GetFOV_Pixel() returned any 'W' class return code except PGSCSC_W_PREDICTED_UT1; bit 15: PGS_CSC_GetFOV_Pixel() returned any 'E' class return code |
| satzen | 32-bit floating-point | None | Spacecraft zenith angle (0.0 ... 180.0) degrees from zenith (measured relative to the geodetic vertical on the reference (WGS84) spheroid and including corrections outlined in EOS SDP toolkit for normal accuracy.) |
| satazi | 32-bit floating-point | None | Spacecraft azimuth angle (-180.0 ... 180.0) degrees E of N GEO) |
| solzen | 32-bit floating-point | None | Solar zenith angle (0.0 ... 180.0) degrees from zenith (measured relative to the geodetic vertical on the reference (WGS84) spheroid and including corrections outlined in EOS SDP toolkit for normal accuracy.) |
| solazi | 32-bit floating-point | None | Solar azimuth angle (-180.0 ... 180.0) degrees E of N GEO) |
| sun_glint_distance | 16-bit integer | None | Distance (km) from footprint center to location of the sun glint (-9999 for unknown, 30000 for no glint visible because spacecraft is in Earth's shadow) |
| topog | 32-bit floating-point | None | Mean topography in meters above reference ellipsoid |
| topog_err | 32-bit floating-point | None | Error estimate for topog |
| landFrac | 32-bit floating-point | None | Fraction of spot that is land (0.0 ... 1.0) |
| landFrac_err | 32-bit floating-point | None | Error estimate for landFrac |
| antenna_temp | 32-bit floating-point | Channel (= 15) | Raw antenna temperature in Kelvins |
| brightness_temp | 32-bit floating-point | Channel (= 15) | Sidelobe-corrected antenna temperatures in Kelvins |
| brightness_temp_err | 32-bit floating-point | Channel (= 15) | Error in brightness_temp (K) |

Size: 305100 bytes (0.3 MB) per 45-scanset granule

Total File Size (plus storage for dimensions and other HDF-EOS overhead): 394340 bytes (0.4 MB) per 45-scanset granule = 94.6 MB per day

Special AIRS Types

Limited Engineering Struct: This type is used for engineering data fields for which there are known "yellow" limits

| Field Name | Type | Explanation |
|------------|-----------------------|--|
| min | 32-bit floating-point | Minimum value field takes on in granule (not valid when num_in = 0) |
| max | 32-bit floating-point | Maximum value field takes on in granule (not valid when num_in = 0) |
| mean | 32-bit floating-point | Mean of in-range values field takes on in granule (not valid when num_in = 0) |
| dev | 32-bit floating-point | Standard Deviation of in-range values field takes on in granule (not valid when num_in = 0) |
| num_in | 32-bit integer | Count of in-range values field takes on in granule |
| num_lo | 32-bit integer | Count of out-of-range low values field takes on in granule |
| num_hi | 32-bit integer | Count of out-of-range high values field takes on in granule |
| num_bad | 32-bit integer | Count of occasions on which field takes on invalid flag value (-9999) in granule |
| range_min | 32-bit floating-point | Minimum in-range value. Any value less than this is counted in num_lo and is not used in the calculation of mean & dev. |
| range_max | 32-bit floating-point | Maximum in-range value. Any value greater than this is counted in num_hi and is not used in the calculation of mean & dev. |
| missing | 8-bit integer | Missing limits flags. Bit 0 (LSB) is 1 when yellow low (range_min) limit is missing; Bit 1 is high when yellow high (range_max) limit is missing; other bits unused, set to 0. |
| max_track | 32-bit integer | GeoTrack index (counting from 1) where max was found |
| max_xtrack | 32-bit integer | GeoXTrack index (counting from 1) where max was found |
| min_track | 32-bit integer | GeoTrack index (counting from 1) where min was found |
| min_xtrack | 32-bit integer | GeoXTrack index (counting from 1) where min was found |

Unlimited Engineering Struct: This type is used for engineering data fields for which there are NOT known "yellow" limits

| Field Name | Type | Explanation |
|------------|-----------------------|---|
| min | 32-bit floating-point | Minimum value field takes on in granule (not valid when num = 0) |
| max | 32-bit floating-point | Maximum value field takes on in granule (not valid when num = 0) |
| mean | 32-bit floating-point | Mean of values field takes on in granule (not valid when num = 0) |
| dev | 32-bit floating-point | Standard Deviation of values field takes on in granule (not valid when num = 0) |
| num | 32-bit integer | Count of occurrences of field in granule (not including those counted in num_bad) |
| num_bad | 32-bit integer | Count of occasions on which field takes on invalid flag value (-9999) in granule |
| max_track | 32-bit integer | GeoTrack index (counting from 1) where max was found |
| max_xtrack | 32-bit integer | GeoXTrack index (counting from 1) where max was found |
| min_track | 32-bit integer | GeoTrack index (counting from 1) where min was found |
| min_xtrack | 32-bit integer | GeoXTrack index (counting from 1) where min was found |

A1-14. L1B HSB Science Interface Specification

Interface Specification Version 3.0.4.0
2003-05-19

ESDT ShortName = "AIRHBRAD"

Swath Name = "L1B_HSB"

Level = "level1B"

Footprints = 90

scanlines per scanset = 3

Dimensions

These fields define all dimensions that can be used for HDF-EOS swath fields.

The names "GeoTrack" and "GeoXTrack" have a special meaning for this document: "Cross-Track" data fields have a hidden dimension of "GeoXTrack"; "Along-Track" data fields have a hidden dimension of "GeoTrack"; "Full Swath Data Fields have hidden dimensions of both "GeoTrack" and "GeoXTrack".

| Name | Value | Explanation |
|-------------|--------------------------|---|
| GeoXTrack | 90 | Dimension across track for footprint positions. Same as number of footprints per scanline. -- starting at the left and increasing towards the right as you look along the satellite's path |
| GeoTrack | # of scan lines in swath | Dimension along track for footprint positions. Same as number of scanlines in granule. Parallel to the satellite's path, increasing with time. (Nominally 45 for Level-2, AMSU-A, and AIRS/Vis low-rate engineering; 135 for AIRS/Vis and HSB high-rate quantities) |
| Channel | 5 | Dimension of channel array (Channel 1: Deleted 89.0 GHz channel: always invalid; Ch 2: 150.0 GHz; Ch 3: f0 +/- 1.0 GHz; Ch 4: f0 +/- 3.0 GHz; Ch 5: f0 +/- 7.0 GHz (f0 = 183.31 GHz)) |
| CalXTrack | 8 | Dimension "across" track for calibration footprint positions. Same as number of calibration footprints per scanline. (NUM_FOOTPRINTS_HSB_CALIB) (Footprints are ordered: 1-4: spaceviews; 5-8: blackbody radiometric calibration source) |
| SpaceXTrack | 4 | Dimension "across" track for spaceview calibration footprint positions in order of observation time. (NUM_FOOTPRINTS_HSB_SPACE) |
| BBXTrack | 4 | Dimension "across" track for blackbody calibration footprint positions in order of observation time. (NUM_FOOTPRINTS_HSB_BB) |
| WarmPRT | 7 | Number of PRTs measuring warm target |

Geolocation Fields

These fields appear for every footprint (GeoTrack * GeoXTrack times) and correspond to footprint center coordinates and "shutter" time.

| Name | Explanation |
|-----------|--|
| Latitude | Footprint boresight geodetic Latitude in degrees North (-90.0 ... 90.0) |
| Longitude | Footprint boresight geodetic Longitude in degrees East (-180.0 ... 180.0) |
| Time | Footprint "shutter" TAI Time: floating-point elapsed seconds since Jan 1, 1993 |

Size: 291600 bytes (0.3 MB) per 45-scanset granule

Attributes

These fields appear only once per granule

| Name | Type | Extra Dimensions | Explanation |
|------------------|----------------------------|------------------|---|
| processing_level | string of 8-bit characters | None | Zero-terminated character string denoting processing level ("level1B") |
| instrument | string of 8-bit characters | None | Zero-terminated character string denoting instrument ("HSB") |
| DayNightFlag | string of 8-bit characters | None | Zero-terminated character string denoting granule as day and/or night: (Always "Day", "Night", or "Both") |
| AutomaticQAFlag | string of 8-bit characters | None | Zero-terminated character string denoting granule data quality: (Always "Passed", "Failed", or "Suspect") |
| NumTotalData | 32-bit integer | None | Total number of expected channels * scene FOVs |
| NumProcessData | 32-bit integer | None | Number of channels * scene FOVs which are present and can be processed |

| | | | |
|-----------------|----------------------------|------|--|
| | | | routinely (state = 0) |
| NumSpecialData | 32-bit integer | None | Number of channels * scene FOVs which are present and can be processed only as a special test (state = 1) |
| NumBadData | 32-bit integer | None | Number of channels * scene FOVs which are present but cannot be processed (state = 2) |
| NumMissingData | 32-bit integer | None | Number of expected channels * scene FOVs which are not present (state = 3) |
| NumLandSurface | 32-bit integer | None | Number of scene footprints for which the surface is more than 90% land |
| NumOceanSurface | 32-bit integer | None | Number of scene footprints for which the surface is less than 10% land |
| node_type | string of 8-bit characters | None | Zero-terminated character string denoting whether granule is ascending, descending, or pole-crossing: ("Ascending" and "Descending" for entirely ascending or entirely descending granules, or "NorthPole" or "SouthPole" for pole-crossing granules) |
| start_year | 32-bit integer | None | Year in which granule started, UTC (e.g. 1999) |
| start_month | 32-bit integer | None | Month in which granule started, UTC (1 ... 12) |
| start_day | 32-bit integer | None | Day of month in which granule started, UTC (1 ... 31) |
| start_hour | 32-bit integer | None | Hour of day in which granule started, UTC (0 ... 23) |
| start_minute | 32-bit integer | None | Minute of hour in which granule started, UTC (0 ... 59) |
| start_sec | 32-bit floating-point | None | Second of minute in which granule started, UTC (0.0 ... 59.0) |
| start_orbit | 32-bit integer | None | Orbit number of mission in which granule started |
| end_orbit | 32-bit integer | None | Orbit number of mission in which granule ended |
| orbit_path | 32-bit integer | None | Orbit path of start orbit (1 ... 233 as defined by EOS project) |
| start_orbit_row | 32-bit integer | None | Orbit row at start of granule (1 ... 248 as defined by EOS project) |
| end_orbit_row | 32-bit integer | None | Orbit row at end of granule (1 ... 248 as defined by EOS project) |
| granule_number | 32-bit integer | None | Number of granule within day (1 ... 240) |
| num_scansets | 32-bit integer | None | Number of scansets in granule (1 ... 45) |
| num_scanlines | 32-bit integer | None | Number of scanlines in granule (3 * num_scansets) |
| start_Latitude | 64-bit floating-point | None | Geodetic Latitude of spacecraft at start of granule in degrees North (-90.0 ... 90.0) |
| start_Longitude | 64-bit floating-point | None | Geodetic Longitude of spacecraft at start of granule in degrees East (-180.0 ... 180.0) |
| start_Time | 64-bit floating-point | None | TAI Time at start of granule (floating-point elapsed seconds since start of 1993) |
| end_Latitude | 64-bit floating-point | None | Geodetic Latitude of spacecraft at end of granule in degrees North (-90.0 ... 90.0) |
| end_Longitude | 64-bit floating-point | None | Geodetic Longitude of spacecraft at end of granule in degrees East (-180.0 ... 180.0) |
| end_Time | 64-bit floating-point | None | TAI Time at end of granule (floating-point elapsed seconds since start of 1993) |
| eq_x_longitude | 32-bit floating-point | None | Longitude of spacecraft at southward equator crossing nearest granule start in degrees East (-180.0 ... 180.0) |
| eq_x_tai | 64-bit floating-point | None | Time of eq_x_longitude in TAI units (floating-point elapsed seconds since start of 1993) |
| orbitgeoqa | 32-bit unsigned integer | None | Orbit Geolocation QA: bit 0 (LSB): bad input value (last scanline); bit 1: bad input value (first scanline); bit 2: PGS_EPH_GetEphMet() returned PGSEPH_E_NO_SC_EPHEM_FILE; bit 3: PGS_EPH_GetEphMet() returned PGSEPH_E_BAD_ARRAY_SIZE; bit 4: PGS_EPH_GetEphMet() returned PGSTD_E_TIME_FMT_ERROR; bit 5: PGS_EPH_GetEphMet() returned PGSTD_E_TIME_VALUE_ERROR; bit 6: PGS_EPH_GetEphMet() returned PGSTD_E_SC_TAG_UNKNOWN; bit 7: PGS_EPH_GetEphMet() returned PGS_E_TOOLKIT; bit 8: PGS_TD_UTCtoTAI() returned PGSTD_E_NO_LEAP_SECS; bit 9: PGS_TD_UTCtoTAI() returned PGSTD_E_TIME_FMT_ERROR; bit 10: PGS_TD_UTCtoTAI() returned PGSTD_E_TIME_VALUE_ERROR; bit 11: PGS_TD_UTCtoTAI() returned PGS_E_TOOLKIT; bit 12: PGS_CSC_DayNight() returned PGSTD_E_NO_LEAP_SECS; bit 13: PGS_CSC_DayNight() returned PGSCSC_E_INVALID_LIMITTAG; bit 14: PGS_CSC_DayNight() returned PGSCSC_E_BAD_ARRAY_SIZE; bit 15: PGS_CSC_DayNight() returned PGSCSC_W_ERROR_IN_DAYNIGHT; bit 16: PGS_CSC_DayNight() returned PGSCSC_W_BAD_TRANSFORM_VALUE; bit 17: PGS_CSC_DayNight() returned PGSCSC_W_BELOW_HORIZON; bit 18: PGS_CSC_DayNight() returned PGSCSC_W_PREDICTED_UT1; bit 19: PGS_CSC_DayNight() returned PGSTD_E_NO_UT1_VALUE; bit 20: PGS_CSC_DayNight() returned PGSTD_E_BAD_INITIAL_TIME; bit 21: PGS_CSC_DayNight() returned PGSCRP_F_TIME_OUT_OF_RANGE; bit |

| | | | |
|-------------------------------|--|-----------------------------------|--|
| | | | 22: PGS_CSC_DayNight() returned PGSCBP_E_UNABLE_TO_OPEN_FILE; bit 22: PGS_CSC_DayNight() returned PGSMEM_E_NO_MEMORY; bit 24: PGS_CSC_DayNight() returned PGS_E_TOOLKIT; bit 25-31: not used |
| num_satgeoqa | 16-bit integer | None | Number of scans with problems in satgeoqa |
| num_glintgeoqa | 16-bit integer | None | Number of scans with problems in glintgeoqa |
| num_moongeoqa | 16-bit integer | None | Number of scans with problems in moongeoqa |
| num_ftptgeoqa | 16-bit integer | None | Number of footprints with problems in ftptgeoqa |
| num_zengeoqa | 16-bit integer | None | Number of footprints with problems in zengeoqa |
| num_demgeoqa | 16-bit integer | None | Number of footprints with problems in demgeoqa |
| num_fpe | 16-bit integer | None | Number of floating point errors |
| LonGranuleCen | 16-bit integer | None | Geodetic Longitude of the center of the granule in degrees East (-180 ... 180) |
| LatGranuleCen | 16-bit integer | None | Geodetic Latitude of the center of the granule in degrees North (-90 ... 90) |
| LocTimeGranuleCen | 16-bit integer | None | Local solar time at the center of the granule in minutes past midnight (0 ... 1439) |
| center_freq | 32-bit floating-point | Channel (= 5) | Channel Center frequency (GHz) |
| IF_offset_1 | 32-bit floating-point | Channel (= 5) | Offset of first intermediate frequency stage (MHz) (zero for no mixing) |
| IF_offset_2 | 32-bit floating-point | Channel (= 5) | Offset of second intermediate frequency stage (MHz) (zero for no second mixing) |
| bandwidth | 32-bit floating-point | Channel (= 5) | Bandwidth of sum of 1, 2, or 4 channels (MHz) |
| num_scanlines_not_norm_mode | 32-bit integer | None | Number of scanlines not in Process state |
| num_calibrated_scanlines | 32-bit integer | Channel (= 5) | Number of scanlines that had calibration coefs applied |
| num_missing_scanlines | 32-bit integer | None | Number of scanlines with state = missing |
| num_data_gaps | 32-bit integer | None | Number of blocks of scanlines where State is not Process |
| num_instr_mode_changes | 32-bit integer | None | Number of operational instrument mode changes |
| num_scanlines_rec_cal_prob | 32-bit integer | None | Number of scanlines with non-zero qa_receiver |
| num_scanlines_ch_cal_problems | 32-bit integer | Channel (= 5) | Number of scanlines with non-zero qa_channel |
| num_scanlines_sig_coast_xing | 32-bit integer | None | Number of scanlines with qa_scanline coast crossing bit set |
| num_scanlines_sig_sun_glint | 32-bit integer | None | Number of scanlines with qa_scanline sun glint bit set |
| MoonInViewMWCCount | 32-bit integer | None | Number of scanlines in granule with the moon in the HSB space view |
| QA_unfiltered_scene_count | Unlimited Engineering Struct (see below) | GeoXTrack (= 90) * Channel (= 5) | Per footprint position raw scene count summary QA |
| QA_unfiltered_BB_count | Unlimited Engineering Struct (see below) | BBXTrack (= 4) * Channel (= 5) | Per BB footprint position raw warm count summary QA (unfiltered) |
| QA_unfiltered_space_count | Unlimited Engineering Struct (see below) | SpaceXTrack (= 4) * Channel (= 5) | Per space footprint position raw cold count summary QA (unfiltered) |
| QA_bb_PRT | Limited Engineering Struct (see below) | None | Blackbody PRT temperature summary QA (C) |
| QA_rec_PRT | Limited Engineering Struct (see below) | None | Receiver PRT temperature summary QA (C) |
| QA_cal_coef_a0 | Unlimited Engineering Struct (see below) | Channel (= 5) | Calibration coefficient a0 summary QA (K) |
| QA_cal_coef_a1 | Unlimited Engineering Struct (see below) | Channel (= 5) | Calibration coefficient a1 summary QA (K/count) |
| QA_cal_coef_a2 | Unlimited Engineering Struct (see below) | Channel (= 5) | Calibration coefficient a2 summary QA (K/count**2) |

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|------------------------|--|---------------|---|
| | below) | | |
| QA_bb_raw_noise_counts | Unlimited Engineering Struct (see below) | Channel (= 5) | Summary QA on differences between warm cal counts |
| QA_sv_raw_noise_counts | Unlimited Engineering Struct (see below) | Channel (= 5) | Summary QA on differences between cold cal counts |
| QA_NeDT | Unlimited Engineering Struct (see below) | Channel (= 5) | Summary QA on gain * differences between warm cal counts (K) |
| QA_NeDT2NomRatio | Unlimited Engineering Struct (see below) | Channel (= 5) | Summary QA on gain * differences between warm cal counts over nominal NeDT (unitless) |
| granules_present | string of 8-bit characters | None | Zero-terminated character string denoting which adjacent granules were available for smoothing ("All" for both previous & next, "Prev" for previous but not next, "Next" for next but not previous, "None" for neither previous nor next) |

Size: 29886 bytes (0.0 MB) per granule

Along-Track Data Fields

These fields appear once per scanline (GeoTrack times)

| Name | Type | Extra Dimensions | Explanation |
|------------|-------------------------|------------------|--|
| satheight | 32-bit floating-point | None | Satellite altitude at nadirTAI in km above reference ellipsoid (e.g. 725.2) |
| satroll | 32-bit floating-point | None | Satellite attitude roll angle at nadirTAI (-180.0 ... 180.0 angle about the +x (roll) ORB axis, +x axis is positively oriented in the direction of orbital flight completing an orthogonal triad with y and z.) |
| satpitch | 32-bit floating-point | None | Satellite attitude pitch angle at nadirTAI (-180.0 ... 180.0 angle about +y (pitch) ORB axis. +y axis is oriented normal to the orbit plane with the positive sense opposite to that of the orbit's angular momentum vector H.) |
| satyaw | 32-bit floating-point | None | Satellite attitude yaw angle at nadirTAI (-180.0 ... 180.0 angle about +z (yaw) axis. +z axis is positively oriented earthward parallel to the satellite radius vector R from the spacecraft center of mass to the center of the Earth.) |
| satgeoqa | 32-bit unsigned integer | None | Satellite Geolocation QA flags: bit 0 (LSB): bad input value; bit 1: PGS_TD_TAtoUTC() returned PGSTD_E_NO_LEAP_SECS; bit 2: PGS_TD_TAtoUTC() returned PGS_E_TOOLKIT; bit 3: PGS_EPH_EphemAttit() returned PGSEPH_W_BAD_EPHEM_VALUE; bit 4: PGS_EPH_EphemAttit() returned PGSEPH_E_BAD_EPHEM_FILE_HDR; bit 5: PGS_EPH_EphemAttit() returned PGSEPH_E_NO_SC_EPHEM_FILE; bit 6: PGS_EPH_EphemAttit() returned PGSEPH_E_NO_DATA_REQUESTED; bit 7: PGS_EPH_EphemAttit() returned PGSTD_E_SC_TAG_UNKNOWN; bit 8: PGS_EPH_EphemAttit() returned PGSEPH_E_BAD_ARRAY_SIZE; bit 9: PGS_EPH_EphemAttit() returned PGSTD_E_TIME_FMT_ERROR; bit 10: PGS_EPH_EphemAttit() returned PGSTD_E_TIME_VALUE_ERROR; bit 11: PGS_EPH_EphemAttit() returned PGSTD_E_NO_LEAP_SECS; bit 12: PGS_EPH_EphemAttit() returned PGS_E_TOOLKIT; bit 13: PGS_CSC_ECtoECR() returned PGSCSC_W_BAD_TRANSFORM_VALUE; bit 14: PGS_CSC_ECtoECR() returned PGSCSC_E_BAD_ARRAY_SIZE; bit 15: PGS_CSC_ECtoECR() returned PGSTD_E_NO_LEAP_SECS; bit 16: PGS_CSC_ECtoECR() returned PGSTD_E_TIME_FMT_ERROR; bit 17: PGS_CSC_ECtoECR() returned PGSTD_E_TIME_VALUE_ERROR; bit 18: unused (set to zero); bit 19: PGS_CSC_ECtoECR() returned PGSTD_E_NO_UT1_VALUE; bit 20: PGS_CSC_ECtoECR() returned PGS_E_TOOLKIT; bit 21: PGS_CSC_ECRtoGEO() returned PGSCSC_W_TOO_MANY_ITERS; bit 22: PGS_CSC_ECRtoGEO() returned PGSCSC_W_INVALID_ALTITUDE; bit 23: PGS_CSC_ECRtoGEO() returned PGSCSC_W_SPHERE_BODY; bit 24: PGS_CSC_ECRtoGEO() returned PGSCSC_W_LARGE_FLATTENING; bit 25: PGS_CSC_ECRtoGEO() returned PGSCSC_W_DEFAULT_EARTH_MODEL; bit 26: PGS_CSC_ECRtoGEO() returned PGSCSC_E_BAD_EARTH_MODEL; bit 27: PGS_CSC_ECRtoGEO() returned PGS_E_TOOLKIT; bit 28-31: not used |
| glintgeoqa | 16-bit unsigned integer | None | Glint Geolocation QA flags: bit 0 (LSB): bad input value; bit 1: glint location in Earth's shadow; bit 2: glint calculation not converging; bit 3: glint location sun vs. satellite zenith mismatch; bit 4: glint location sun vs. satellite azimuth mismatch; bit 5: bad glint location; bit 6: PGS_CSC_ZenithAzimuth() returned any 'W' class return code; bit 7: PGS_CSC_ZenithAzimuth() returned any 'E' class return code; bit 8: PGS_CBP_Earth_CB_Vector() returned any 'W' class return code; bit 9: PGS_CBP_Earth_CB_Vector() returned any 'E' class return code; bit 10: PGS_CSC_ECtoECR() returned any 'W' class return code except PGSCSC_W_PREDICTED_UT1 (for Glint); bit 11: PGS_CSC_ECtoECR() returned any 'E' class return code (for Glint); bit 12: PGS_CSC_ECRtoGEO() returned any 'W' class return code (for Glint); bit 13: PGS_CSC_ECRtoGEO() returned any 'E' class return code (for Glint); bit 14: PGS_CSC_ECtoECR() returned any 'W' class return code except PGSCSC_W_PREDICTED_UT1; bit 15: PGS_CSC_ECtoECR() returned any 'E' class return code |

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|--------------------|-------------------------|---------------|---|
| moongeoqa | 16-bit unsigned integer | None | Moon Geolocation QA flags: bit 0 (LSB): bad input value; bit 1: PGS_TD_TAtoUTC() returned PGSTD_E_NO_LEAP_SECS; bit 2: PGS_TD_TAtoUTC() returned PGS_E_TOOLKIT; bit 3: PGS_CBP_Sat_CB_Vector() returned PGSCSC_W_BELOW_SURFACE; bit 4: PGS_CBP_Sat_CB_Vector() returned PGSCBP_W_BAD_CB_VECTOR; bit 5: PGS_CBP_Sat_CB_Vector() returned PGSCBP_E_BAD_ARRAY_SIZE; bit 6: PGS_CBP_Sat_CB_Vector() returned PGSCBP_E_INVALID_CB_ID; bit 7: PGS_CBP_Sat_CB_Vector() returned PGSMEM_E_NO_MEMORY; bit 8: PGS_CBP_Sat_CB_Vector() returned PGSCBP_E_UNABLE_TO_OPEN_FILE; bit 9: PGS_CBP_Sat_CB_Vector() returned PGSTD_E_BAD_INITIAL_TIME; bit 10: PGS_CBP_Sat_CB_Vector() returned PGSCBP_E_TIME_OUT_OF_RANGE; bit 11: PGS_CBP_Sat_CB_Vector() returned PGSTD_E_SC_TAG_UNKNOWN; bit 12: PGS_CBP_Sat_CB_Vector() returned PGSEPH_E_BAD_EPHEM_FILE_HDR; bit 13: PGS_CBP_Sat_CB_Vector() returned PGSEPH_E_NO_SC_EPHEM_FILE; bit 14: PGS_CBP_Sat_CB_Vector() returned PGS_E_TOOLKIT; bit 15: not used |
| nadirTAI | 64-bit floating-point | None | TAI time at which instrument is nominally looking directly down. (between footprints 15 & 16 for AMSU or between footprints 45 & 46 for AIRS/Vis & HSB) (floating-point elapsed seconds since start of 1993) |
| sat_lat | 64-bit floating-point | None | Satellite geodetic latitude in degrees North (-90.0 ... 90.0) |
| sat_lon | 64-bit floating-point | None | Satellite geodetic longitude in degrees East (-180.0 ... 180.0) |
| scan_node_type | 8-bit integer | None | 'A' for ascending, 'D' for descending, 'N' for North-Polar, 'S' for South-Polar |
| glintlat | 32-bit floating-point | None | Solar glint geodetic latitude in degrees North at nadirTAI (-90.0 ... 90.0) |
| glintlon | 32-bit floating-point | None | Solar glint geodetic longitude in degrees East at nadirTAI (-180.0 ... 180.0) |
| state | 32-bit integer | None | Data state: 0:Process, 1:Special, 2:Erroneous, 3:Missing |
| cal_coef_a0 | 32-bit floating-point | Channel (= 5) | Calibration coefficients to convert raw counts to antenna temperature (K) |
| cal_coef_a1 | 32-bit floating-point | Channel (= 5) | Calibration coefficients to convert raw counts to antenna temperature (K/count) |
| cal_coef_a2 | 32-bit floating-point | Channel (= 5) | Calibration coefficients to convert raw counts to antenna temperature (K/count**2) |
| cal_coef_a0_err | 32-bit floating-point | Channel (= 5) | Error estimate for cal_coef_a0 (K) |
| cal_coef_a1_err | 32-bit floating-point | Channel (= 5) | Error estimate for cal_coef_a1 (K/count) |
| cal_coef_a2_err | 32-bit floating-point | Channel (= 5) | Error estimate for cal_coef_a2 (K/count**2) |
| SpacViewSelct | 8-bit integer | None | Space View Selected |
| mixer_17_temp_used | 8-bit integer | None | Mixer 17 Temperature use flag. (1: used mixer 17 temperature for receiver temperature; 0: used mixer 18/19/20 temperature) |
| receiver_temp | 32-bit floating-point | None | Receiver temperature used in calibration (mixer 17 temperature or mixer 18/19/20 temperature as specified by mixer_17_temp_used) (C) |
| target_temp | 32-bit floating-point | None | HSB target temperature used in calibration (C) |
| qa_scanline | 8-bit unsigned integer | None | Scanline bitmap for HSB: Bit 0: Sun glint in this scanline; Bit 1: Coastal crossing in this scanline; Bit 2: Some channels had excessive NeDT estimate; Bit 3: Near sidelobe correction applied |
| qa_receiver | 8-bit unsigned integer | None | Receiver bitmap for HSB: Bit 0: Calibration was not derived, due to the instrument mode; Bit 1: Calibration was not derived, due to bad or missing PRT values; Bit 2: This scanline was calibrated, but the moon was in the space view; Bit 3: This scanline was calibrated, but there was a space view scan position err; Bit 4: This scanline was calibrated, but there was a blackbody scan position error; Bit 5: This scanline was calibrated, but some PRT values were bad or marginal; Bit 6: This scanline was calibrated, but there was a data gap; Bit 7: Some channels were not calibrated |
| qa_channel | 8-bit unsigned integer | Channel (= 5) | Channel bitmap for HSB: Bit 0: All space view counts were bad for this channel and scanline; Bit 1: Space view counts were marginal for this channel and scanline; Bit 2: Space view counts could not be smoothed; Bit 3: All blackbody counts were bad for this channel and scanline; Bit 4: Blackbody counts were marginal for this channel and scanline; Bit 5: Blackbody counts could not be smoothed; Bit 6: Most recent calibration coefficients used; Bit 7: Excessive NeDT estimated |

Size: 26730 bytes (0.0 MB) per 45-scanset granule

Full Swath Data Fields

These fields appear for every footprint of every scanline in the granule (GeoTrack * GeoXTrack times)

| Name | Type | Extra Dimensions | Explanation |
|--------------------|-------------------------|------------------|---|
| scanang | 32-bit floating-point | None | Scanning angle of HSB instrument with respect to the HSB instrument for this footprint (-180.0 ... 180.0, negative at start of scan, 0 at nadir) |
| ftptgeoqa | 32-bit unsigned integer | None | Footprint Geolocation QA flags: bit 0 (LSB): bad input value; bit 1: PGS_TD_TAtoUTC() returned PGSTD_E_NO_LEAP_SECS; bit 2: PGS_TD_TAtoUTC() returned PGS_E_TOOLKIT; bit 3: PGS_CSC_GetFOV_Pixel() returned PGSCSC_W_MISS_EARTH; bit 4: PGS_CSC_GetFOV_Pixel() returned PGSTD_E_SC_TAG_UNKNOWN; bit 5: PGS_CSC_GetFOV_Pixel() returned PGSCSC_W_ZERO_PIXEL_VECTOR; bit 6: PGS_CSC_GetFOV_Pixel() returned PGSCSC_W_BAD_EPH_FOR_PIXEL; bit 7: PGS_CSC_GetFOV_Pixel() returned PGSCSC_W_INSTRUMENT_OFF_BOARD; bit 8: PGS_CSC_GetFOV_Pixel() returned PGSCSC_W_BAD_ACCURACY_FLAG; bit 9: PGS_CSC_GetFOV_Pixel() returned PGSCSC_E_BAD_ARRAY_SIZE; bit 10: PGS_CSC_GetFOV_Pixel() returned PGSCSC_W_DEFAULT_EARTH_MODEL; bit 11: PGS_CSC_GetFOV_Pixel() returned PGSCSC_W_DATA_FILE_MISSING; bit 12: PGS_CSC_GetFOV_Pixel() returned PGSCSC_E_NEG_OR_ZERO_RAD; bit 13: PGS_CSC_GetFOV_Pixel() returned PGSMEM_E_NO_MEMORY; bit 14: PGS_CSC_GetFOV_Pixel() returned PGSTD_E_NO_LEAP_SECS; bit 15: PGS_CSC_GetFOV_Pixel() returned PGSTD_E_TIME_FMT_ERROR; bit 16: PGS_CSC_GetFOV_Pixel() returned PGSTD_E_TIME_VALUE_ERROR; bit 17: PGS_CSC_GetFOV_Pixel() returned PGSCSC_W_PREDICTED_UT1; bit 18: PGS_CSC_GetFOV_Pixel() returned PGSTD_E_NO_UT1_VALUE; bit 19: PGS_CSC_GetFOV_Pixel() returned PGS_E_TOOLKIT; bit 20: PGS_CSC_GetFOV_Pixel() returned PGSEPH_E_BAD_EPHEM_FILE_HDR; bit 21: PGS_CSC_GetFOV_Pixel() returned PGSEPH_E_NO_SC_EPHEM_FILE; bit 22-31: not used |
| zengeoqa | 16-bit unsigned integer | None | Satellite zenith Geolocation QA flags: bit 0 (LSB): (Spacecraft) bad input value; bit 1: PGS_CSC_ZenithAzimuth(S/C) returned PGSCSC_W_BELOW_HORIZON; bit 2: PGS_CSC_ZenithAzimuth(S/C) returned PGSCSC_W_UNDEFINED_AZIMUTH; bit 3: PGS_CSC_ZenithAzimuth(S/C) returned PGSCSC_W_NO_REFRACTION; bit 4: PGS_CSC_ZenithAzimuth(S/C) returned PGSCSC_E_INVALID_VECTAG; bit 5: PGS_CSC_ZenithAzimuth(S/C) returned PGSCSC_E_LOOK_PT_ALTIT_RANGE; bit 6: PGS_CSC_ZenithAzimuth(S/C) returned PGSCSC_E_ZERO_INPUT_VECTOR; bit 7: PGS_CSC_ZenithAzimuth(S/C) returned PGS_E_TOOLKIT; bit 8: (Sun) bad input value; bit 9: (suppressed) PGS_CSC_ZenithAzimuth(Sun) returned PGSCSC_W_BELOW_HORIZON (This is not an error condition - the sun is below the horizon at night); bit 10: PGS_CSC_ZenithAzimuth(Sun) returned PGSCSC_W_UNDEFINED_AZIMUTH; bit 11: PGS_CSC_ZenithAzimuth(Sun) returned PGSCSC_W_NO_REFRACTION; bit 12: PGS_CSC_ZenithAzimuth(Sun) returned PGSCSC_E_INVALID_VECTAG; bit 13: PGS_CSC_ZenithAzimuth(Sun) returned PGSCSC_E_LOOK_PT_ALTIT_RANGE; bit 14: PGS_CSC_ZenithAzimuth(Sun) returned PGSCSC_E_ZERO_INPUT_VECTOR; bit 15: PGS_CSC_ZenithAzimuth(Sun) returned PGS_E_TOOLKIT |
| demgeoqa | 16-bit unsigned integer | None | Digital Elevation Model (DEM) Geolocation QA flags: bit 0 (LSB): bad input value; bit 1: Could not allocate memory; bit 2: Too close to North or South pole. Excluded; bit 3: Layer resolution incompatibility. Excluded; bit 4: Any DEM Routine (elev) returned PGSDM_E_IMPROPER_TAG; bit 5: Any DEM Routine (elev) returned PGSDM_E_CANNOT_ACCESS_DATA; bit 6: Any DEM Routine (land/water) returned PGSDM_E_IMPROPER_TAG; bit 7: Any DEM Routine (land/water) returned PGSDM_E_CANNOT_ACCESS_DATA; bit 8: Reserved for future layers; bit 9: Reserved for future layers; bit 10: PGS_DEM_GetRegion(elev) returned PGSDM_M_FILLVALUE_INCLUDED; bit 11: PGS_DEM_GetRegion(land/water) returned PGSDM_M_FILLVALUE_INCLUDED; bit 12: Reserved for future layers; bit 13: PGS_DEM_GetRegion(all) returned PGSDM_M_MULTIPLE_RESOLUTIONS; bit 14: PGS_CSC_GetFOV_Pixel() returned any 'W' class return code except PGSCSC_W_PREDICTED_UT1; bit 15: PGS_CSC_GetFOV_Pixel() returned any 'E' class return code |
| satzen | 32-bit floating-point | None | Spacecraft zenith angle (0.0 ... 180.0) degrees from zenith (measured relative to the geodetic vertical on the reference (WGS84) spheroid and including corrections outlined in EOS SDP toolkit for normal accuracy.) |
| satazi | 32-bit floating-point | None | Spacecraft azimuth angle (-180.0 ... 180.0) degrees E of N GEO) |
| solzen | 32-bit floating-point | None | Solar zenith angle (0.0 ... 180.0) degrees from zenith (measured relative to the geodetic vertical on the reference (WGS84) spheroid and including corrections outlined in EOS SDP toolkit for normal accuracy.) |
| solazi | 32-bit floating-point | None | Solar azimuth angle (-180.0 ... 180.0) degrees E of N GEO) |
| sun_glint_distance | 16-bit integer | None | Distance (km) from footprint center to location of the sun glint (-9999 for unknown, 30000 for no glint visible because spacecraft is in Earth's shadow) |
| topog | 32-bit floating-point | None | Mean topography in meters above reference ellipsoid |
| topog_err | 32-bit floating-point | None | Error estimate for topog |
| landFrac | 32-bit floating-point | None | Fraction of spot that is land (0.0 ... 1.0) |
| landFrac_err | 32-bit floating-point | None | Error estimate for landFrac |
| antenna_temp | 32-bit floating-point | Channel (= | Raw antenna temperature in Kelvins |

| | | | |
|---------------------|-----------------------|---------------|--|
| | point | 5) | |
| brightness_temp | 32-bit floating-point | Channel (= 5) | Sidelobe-corrected antenna temperatures in Kelvins |
| brightness_temp_err | 32-bit floating-point | Channel (= 5) | Error in brightness_temp (K) |

Size: 1287900 bytes (1.3 MB) per 45-scanset granule

**Total File Size (plus storage for dimensions and other HDF-EOS overhead):
1636116 bytes (1.6 MB) per 45-scanset granule = 392.7 MB per day**

Special AIRS Types

Limited Engineering Struct: This type is used for engineering data fields for which there are known "yellow" limits

| Field Name | Type | Explanation |
|------------|-----------------------|--|
| min | 32-bit floating-point | Minimum value field takes on in granule (not valid when num_in = 0) |
| max | 32-bit floating-point | Maximum value field takes on in granule (not valid when num_in = 0) |
| mean | 32-bit floating-point | Mean of in-range values field takes on in granule (not valid when num_in = 0) |
| dev | 32-bit floating-point | Standard Deviation of in-range values field takes on in granule (not valid when num_in = 0) |
| num_in | 32-bit integer | Count of in-range values field takes on in granule |
| num_lo | 32-bit integer | Count of out-of-range low values field takes on in granule |
| num_hi | 32-bit integer | Count of out-of-range high values field takes on in granule |
| num_bad | 32-bit integer | Count of occasions on which field takes on invalid flag value (-9999) in granule |
| range_min | 32-bit floating-point | Minimum in-range value. Any value less than this is counted in num_lo and is not used in the calculation of mean & dev. |
| range_max | 32-bit floating-point | Maximum in-range value. Any value greater than this is counted in num_hi and is not used in the calculation of mean & dev. |
| missing | 8-bit integer | Missing limits flags. Bit 0 (LSB) is 1 when yellow low (range_min) limit is missing; Bit 1 is high when yellow high (range_max) limit is missing; other bits unused, set to 0. |
| max_track | 32-bit integer | GeoTrack index (counting from 1) where max was found |
| max_xtrack | 32-bit integer | GeoXTrack index (counting from 1) where max was found |
| min_track | 32-bit integer | GeoTrack index (counting from 1) where min was found |
| min_xtrack | 32-bit integer | GeoXTrack index (counting from 1) where min was found |

Unlimited Engineering Struct: This type is used for engineering data fields for which there are NOT known "yellow" limits

| Field Name | Type | Explanation |
|------------|-----------------------|---|
| min | 32-bit floating-point | Minimum value field takes on in granule (not valid when num = 0) |
| max | 32-bit floating-point | Maximum value field takes on in granule (not valid when num = 0) |
| mean | 32-bit floating-point | Mean of values field takes on in granule (not valid when num = 0) |
| dev | 32-bit floating-point | Standard Deviation of values field takes on in granule (not valid when num = 0) |
| num | 32-bit integer | Count of occurrences of field in granule (not including those counted in num_bad) |
| num_bad | 32-bit integer | Count of occasions on which field takes on invalid flag value (-9999) in granule |
| max_track | 32-bit integer | GeoTrack index (counting from 1) where max was found |
| max_xtrack | 32-bit integer | GeoXTrack index (counting from 1) where max was found |
| min_track | 32-bit integer | GeoTrack index (counting from 1) where min was found |
| min_xtrack | 32-bit integer | GeoXTrack index (counting from 1) where min was found |

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A1-15. L2 Standard Atmospheric/Surface Product Interface Specification

Interface Specification Version 3.0.4.0
2003-05-19

ESDT ShortName = "AIRX2RET"

Swath Name = "L2_Standard_atmospheric&surface_product"

Level = "level2"

Footprints = 30

scanlines per scanset = 1

Dimensions

These fields define all dimensions that can be used for HDF-EOS swath fields.

The names "GeoTrack" and "GeoXTrack" have a special meaning for this document: "Cross-Track" data fields have a hidden dimension of "GeoXTrack"; "Along-Track" data fields have a hidden dimension of "GeoTrack"; "Full Swath Data Fields have hidden dimensions of both "GeoTrack" and "GeoXTrack".

| Name | Value | Explanation |
|----------------|--------------------------|---|
| GeoXTrack | 30 | Dimension across track for footprint positions. Same as number of footprints per scanline. -- starting at the left and increasing towards the right as you look along the satellite's path |
| GeoTrack | # of scan lines in swath | Dimension along track for footprint positions. Same as number of scanlines in granule. Parallel to the satellite's path, increasing with time. (Nominally 45 for Level-2, AMSU-A, and AIRS/Vis low-rate engineering; 135 for AIRS/Vis and HSB high-rate quantities) |
| StdPressureLev | 28 | Number of standard pressure altitude levels (from bottom of the atmosphere up) |
| StdPressureLay | 28 | Number of standard pressure altitude layers (Always equal to StdPressureLev: last layer goes from level 1 to the top of the atmosphere) |
| AIRSXTrack | 3 | The number of AIRS cross-track spots per AMSU-A spot. Direction is the same as GeoXTrack -- starting at the left and increasing towards the right as you look along the satellite's path |
| AIRSTrack | 3 | The number of AIRS along-track spots per AMSU-A spot. Direction is the same as GeoTrack -- parallel to the satellite's path, increasing with time |
| Cloud | 2 | Cloud layer dimension in order of increasing pressure. Only first numCloud elements are valid |
| ChanAMSUA | 15 | Dimension of AMSU-A Channel array (Channel 1: 23.8 GHz; Ch 2: 31.4 GHz; Ch 3: 50.3 GHz; Ch 4: 52.8 GHz; Ch 5: 53.596 +/- 0.115 GHz; Ch 6: 54.4 GHz; Ch 7: 54.94 GHz; Ch 8: 55.5 GHz; Ch 9: f0; Ch 10: f0 +/- 0.217 GHz Ch 11: f0 +/- df +/- 48 MHz; Ch 12: f0 +/- df +/- 22 MHz; Ch 13: f0 +/- df +/- 10 MHz; Ch 14: f0 +/- df +/- 4.5 MHz; Ch 15: 89 GHz (f0 = 57290.344 MHz; df = 322.4 MHz)) |
| ChanHSB | 5 | Dimension of HSB Channel array (Channel 1: Deleted 89.0 GHz channel: always invalid; Ch 2: 150.0 GHz; Ch 3: f0 +/- 1.0 GHz; Ch 4: f0 +/- 3.0 GHz; Ch 5: f0 +/- 7.0 GHz (f0 = 183.31 GHz)) |
| MWHingeSurf | 7 | Number of standard frequency hinge points in Microwave surface emissivity and surface brightness. Frequencies are 23.8, 31.4, 50.3, 52.8, 89.0, 150.0, 183.3 GHz respectively. |
| HingeSurf | 100 | Maximum number of frequency hinge points in IR surface emissivity |
| Eta | 9 | Maximum number of cloud-clearing weights |

Geolocation Fields

These fields appear for every footprint (GeoTrack * GeoXTrack times) and correspond to footprint center coordinates and "shutter" time.

| Name | Explanation |
|-----------|--|
| Latitude | Footprint boresight geodetic Latitude in degrees North (-90.0 ... 90.0) |
| Longitude | Footprint boresight geodetic Longitude in degrees East (-180.0 ... 180.0) |
| Time | Footprint "shutter" TAI Time: floating-point elapsed seconds since Jan 1, 1993 |

Size: 32400 bytes (0.0 MB) per 45-scanset granule

Attributes

These fields appear only once per granule

| Name | Type | Extra Dimensions | Explanation |
|------------------|----------------------------|------------------|---|
| processing_level | string of 8-bit characters | None | Zero-terminated character string denoting processing level ("level2") |
| instrument | string of 8-bit characters | None | Zero-terminated character string denoting instrument ("AIRS") |
| DayNightFlag | string of 8-bit characters | None | Zero-terminated character string denoting granule as day and/or night: (Always "Day", "Night", or "Both") |
| AutomaticQAFlag | string of 8-bit characters | None | Zero-terminated character string denoting granule data quality: (Always "Passed", "Failed", or "Suspect") |
| NumTotalData | 32-bit integer | None | Total number of expected scene footprints |
| NumProcessData | 32-bit integer | None | Number of scene footprints which are present and can be processed routinely (state = 0) |
| NumSpecialData | 32-bit integer | None | Number of scene footprints which are present and can be processed only as a special test (state = 1) |
| NumBadData | 32-bit integer | None | Number of scene footprints which are present but cannot be processed (state = 2) |
| NumMissingData | 32-bit integer | None | Number of expected scene footprints which are not present (state = 3) |
| NumLandSurface | 32-bit integer | None | Number of scene footprints for which the surface is more than 90% land |
| NumOceanSurface | 32-bit integer | None | Number of scene footprints for which the surface is less than 10% land |
| node_type | string of 8-bit characters | None | Zero-terminated character string denoting whether granule is ascending, descending, or pole-crossing: ("Ascending" and "Descending" for entirely ascending or entirely descending granules, or "NorthPole" or "SouthPole" for pole-crossing granules) |
| start_year | 32-bit integer | None | Year in which granule started, UTC (e.g. 1999) |
| start_month | 32-bit integer | None | Month in which granule started, UTC (1 ... 12) |
| start_day | 32-bit integer | None | Day of month in which granule started, UTC (1 ... 31) |
| start_hour | 32-bit integer | None | Hour of day in which granule started, UTC (0 ... 23) |
| start_minute | 32-bit integer | None | Minute of hour in which granule started, UTC (0 ... 59) |
| start_sec | 32-bit floating-point | None | Second of minute in which granule started, UTC (0.0 ... 59.0) |
| start_orbit | 32-bit integer | None | Orbit number of mission in which granule started |
| end_orbit | 32-bit integer | None | Orbit number of mission in which granule ended |
| orbit_path | 32-bit integer | None | Orbit path of start orbit (1 ... 233 as defined by EOS project) |
| start_orbit_row | 32-bit integer | None | Orbit row at start of granule (1 ... 248 as defined by EOS project) |
| end_orbit_row | 32-bit integer | None | Orbit row at end of granule (1 ... 248 as defined by EOS project) |
| granule_number | 32-bit integer | None | Number of granule within day (1 ... 240) |
| num_scansets | 32-bit integer | None | Number of scansets in granule (1 ... 45) |
| num_scanlines | 32-bit integer | None | Number of scanlines in granule (1 * num_scansets) |
| start_Latitude | 64-bit floating-point | None | Geodetic Latitude of spacecraft at start of granule in degrees North (-90.0 ... 90.0) |
| start_Longitude | 64-bit floating-point | None | Geodetic Longitude of spacecraft at start of granule in degrees East (-180.0 ... 180.0) |
| start_Time | 64-bit floating-point | None | TAI Time at start of granule (floating-point elapsed seconds since start of 1993) |
| end_Latitude | 64-bit floating-point | None | Geodetic Latitude of spacecraft at end of granule in degrees North (-90.0 ... 90.0) |
| end_Longitude | 64-bit floating-point | None | Geodetic Longitude of spacecraft at end of granule in degrees East (-180.0 ... 180.0) |
| end_Time | 64-bit floating-point | None | TAI Time at end of granule (floating-point elapsed seconds since start of 1993) |
| eq_x_longitude | 32-bit floating-point | None | Longitude of spacecraft at southward equator crossing nearest granule start in degrees East (-180.0 ... 180.0) |
| eq_x_tai | 64-bit floating-point | None | Time of eq_x_longitude in TAI units (floating-point elapsed seconds since start of 1993) |
| orbitgeoqa | 32-bit unsigned integer | None | Orbit Geolocation QA: bit 0 (LSB): bad input value (last scanline); bit 1: bad input value (first scanline); bit 2: PGS_EPH_GetEphMet() returned PGSEPH_E_NO_SC_EPHEM_FILE; bit 3: PGS_EPH_GetEphMet() returned PGSEPH_E_BAD_ARRAY_SIZE; bit 4: PGS_EPH_GetEphMet() returned PGSTD_E_TIME_FMT_ERROR; bit 5: PGS_EPH_GetEphMet() returned PGSTD_F_TIME_VAL_IF_ERROR; bit 6: PGS_EPH_GetEphMet() returned |

| | | | |
|--------------------|----------------------------|-----------------------|--|
| | | | PGSTD_E_SC_TAG_UNKNOWN; bit 7: PGS_EPH_GetEphMet() returned PGS_E_TOOLKIT; bit 8: PGS_TD_UTCtoTAI() returned PGSTD_E_NO_LEAP_SECS; bit 9: PGS_TD_UTCtoTAI() returned PGSTD_E_TIME_FMT_ERROR; bit 10: PGS_TD_UTCtoTAI() returned PGSTD_E_TIME_VALUE_ERROR; bit 11: PGS_TD_UTCtoTAI() returned PGS_E_TOOLKIT; bit 12: PGS_CSC_DayNight() returned PGSTD_E_NO_LEAP_SECS; bit 13: PGS_CSC_DayNight() returned PGSCSC_E_INVALID_LIMITTAG; bit 14: PGS_CSC_DayNight() returned PGSCSC_E_BAD_ARRAY_SIZE; bit 15: PGS_CSC_DayNight() returned PGSCSC_W_ERROR_IN_DAYNIGHT; bit 16: PGS_CSC_DayNight() returned PGSCSC_W_BAD_TRANSFORM_VALUE; bit 17: PGS_CSC_DayNight() returned PGSCSC_W_BELOW_HORIZON; bit 18: PGS_CSC_DayNight() returned PGSCSC_W_PREDICTED_UT1; bit 19: PGS_CSC_DayNight() returned PGSTD_E_NO_UT1_VALUE; bit 20: PGS_CSC_DayNight() returned PGSTD_E_BAD_INITIAL_TIME; bit 21: PGS_CSC_DayNight() returned PGSCBP_E_TIME_OUT_OF_RANGE; bit 22: PGS_CSC_DayNight() returned PGSCBP_E_UNABLE_TO_OPEN_FILE; bit 22: PGS_CSC_DayNight() returned PGSMEM_E_NO_MEMORY; bit 24: PGS_CSC_DayNight() returned PGS_E_TOOLKIT; bit 25-31: not used |
| num_satgeoqa | 16-bit integer | None | Number of scans with problems in satgeoqa |
| num_glintgeoqa | 16-bit integer | None | Number of scans with problems in glintgeoqa |
| num_moongoqa | 16-bit integer | None | Number of scans with problems in moongoqa |
| num_ftptgeoqa | 16-bit integer | None | Number of footprints with problems in ftptgeoqa |
| num_zengeoqa | 16-bit integer | None | Number of footprints with problems in zengeoqa |
| num_demgeoqa | 16-bit integer | None | Number of footprints with problems in demgeoqa |
| num_fpe | 16-bit integer | None | Number of floating point errors |
| LonGranuleCen | 16-bit integer | None | Geodetic Longitude of the center of the granule in degrees East (-180 ... 180) |
| LatGranuleCen | 16-bit integer | None | Geodetic Latitude of the center of the granule in degrees North (-90 ... 90) |
| LocTimeGranuleCen | 16-bit integer | None | Local solar time at the center of the granule in minutes past midnight (0 ... 1439) |
| pressStd | 32-bit floating-point | StdPressureLev (= 28) | Standard pressures in mb (bottom of the atmosphere first) |
| num_invalid | 16-bit integer | None | # of footprints where invalid is True |
| num_clear_flag | 16-bit integer | None | # of footprints 100% clear |
| num_MW_ret_used | 16-bit integer | None | # of footprints where MW-only final retrieval used |
| num_retrieval_type | 16-bit integer | None | # of footprints without full retrieval |
| granules_present | string of 8-bit characters | None | Zero-terminated character string denoting which adjacent granules were available for precipitation ("All" for both previous & next, "Prev" for previous but not next, "Next" for next but not previous, "None" for neither previous nor next) |

Size: 294 bytes (0.0 MB) per granule

Along-Track Data Fields

These fields appear once per scanline (GeoTrack times)

| Name | Type | Extra Dimensions | Explanation |
|-----------|-------------------------|------------------|---|
| satheight | 32-bit floating-point | None | Satellite altitude at nadirTAI in km above reference ellipsoid (e.g. 725.2) |
| satroll | 32-bit floating-point | None | Satellite attitude roll angle at nadirTAI (-180.0 ... 180.0 angle about the +x (roll) ORB axis, +x axis is positively oriented in the direction of orbital flight completing an orthogonal triad with y and z.) |
| satpitch | 32-bit floating-point | None | Satellite attitude pitch angle at nadirTAI (-180.0 ... 180.0 angle about +y (pitch) ORB axis, +y axis is oriented normal to the orbit plane with the positive sense opposite to that of the orbit's angular momentum vector H.) |
| satyaw | 32-bit floating-point | None | Satellite attitude yaw angle at nadirTAI (-180.0 ... 180.0 angle about +z (yaw) axis, +z axis is positively oriented earthward parallel to the satellite radius vector R from the spacecraft center of mass to the center of the Earth.) |
| satgeoqa | 32-bit unsigned integer | None | Satellite Geolocation QA flags: bit 0 (LSB): bad input value; bit 1: PGS_TD_TAItUTC() returned PGSTD_E_NO_LEAP_SECS; bit 2: PGS_TD_TAItUTC() returned PGS_E_TOOLKIT; bit 3: PGS_EPH_EphemAttit() returned PGSEPH_W_BAD_EPHEM_VALUE; bit 4: PGS_EPH_EphemAttit() returned PGSEPH_E_BAD_EPHEM_FILE_HDR; bit 5: PGS_EPH_EphemAttit() returned PGSEPH_E_NO_SC_EPHEM_FILE; bit 6: PGS_EPH_EphemAttit() returned PGSEPH_E_NO_DATA_REQUESTED; bit 7: PGS_EPH_EphemAttit() returned PGSTD_E_SC_TAG_UNKNOWN; bit 8: PGS_EPH_EphemAttit() returned PGSEPH_E_BAD_ARRAY_SIZE; bit 9: PGS_EPH_EphemAttit() returned PGSTD_E_TIME_FMT_ERROR; bit 10: PGS_EPH_EphemAttit() returned PGSTD_E_TIME_VALUE_ERROR; bit 11: PGS_EPH_EphemAttit() returned PGSTD_E_NO_LEAP_SECS; bit 12: PGS_EPH_EphemAttit() returned PGS_E_TOOLKIT; bit 13: PGS_CSC_ECItECR() returned PGSCSC_W_BAD_TRANSFORM_VALUE; bit 14: PGS_CSC_ECItECR() returned PGSCSC_E_BAD_ARRAY_SIZE; bit 15: PGS_CSC_ECItECR() returned PGSTD_E_NO_LEAP_SECS; bit 16: PGS_CSC_ECItECR() returned PGSTD_F_TIME_FMT_ERROR; bit 17: PGS_CSC_ECItECR() returned |

| | | | |
|----------------|-------------------------|------|--|
| | | | PGSTD_E_TIME_VALUE_ERROR; bit 18: unused (set to zero); bit 19: PGS_CSC_ECtoECR() returned PGSTD_E_NO_UT1_VALUE; bit 20: PGS_CSC_ECtoECR() returned PGS_E_TOOLKIT; bit 21: PGS_CSC_ECRtoGEO() returned PGSCSC_W_TOO_MANY_ITERS; bit 22: PGS_CSC_ECRtoGEO() returned PGSCSC_W_INVALID_ALTITUDE; bit 23: PGS_CSC_ECRtoGEO() returned PGSCSC_W_SPHERE_BODY; bit 24: PGS_CSC_ECRtoGEO() returned PGSCSC_W_LARGE_FLATTENING; bit 25: PGS_CSC_ECRtoGEO() returned PGSCSC_W_DEFAULT_EARTH_MODEL; bit 26: PGS_CSC_ECRtoGEO() returned PGSCSC_E_BAD_EARTH_MODEL; bit 27: PGS_CSC_ECRtoGEO() returned PGS_E_TOOLKIT; bit 28-31: not used |
| glintgeoqa | 16-bit unsigned integer | None | Glint Geolocation QA flags: bit 0 (LSB): bad input value; bit 1: glint location in Earth's shadow; bit 2: glint calculation not converging; bit 3: glint location sun vs. satellite zenith mismatch; bit 4: glint location sun vs. satellite azimuth mismatch; bit 5: bad glint location; bit 6: PGS_CSC_ZenithAzimuth() returned any 'W' class return code; bit 7: PGS_CSC_ZenithAzimuth() returned any 'E' class return code; bit 8: PGS_CBP_Earth_CB_Vector() returned returned any 'W' class return code; bit 9: PGS_CBP_Earth_CB_Vector() returned returned any 'E' class return code; bit 10: PGS_CSC_ECtoECR() returned any 'W' class return code except PGSCSC_W_PREDICTED_UT1 (for Glint); bit 11: PGS_CSC_ECtoECR() returned any 'E' class return code (for Glint); bit 12: PGS_CSC_ECRtoGEO() returned any 'W' class return code (for Glint); bit 13: PGS_CSC_ECRtoGEO() returned any 'E' class return code (for Glint); bit 14: PGS_CSC_ECtoECR() returned any 'W' class return code except PGSCSC_W_PREDICTED_UT1; bit 15: PGS_CSC_ECtoECR() returned any 'E' class return code |
| moongeoa | 16-bit unsigned integer | None | Moon Geolocation QA flags: bit 0 (LSB): bad input value; bit 1: PGS_TD_TAtoUTC() returned PGSTD_E_NO_LEAP_SECS; bit 2: PGS_TD_TAtoUTC() returned PGS_E_TOOLKIT; bit 3: PGS_CBP_Sat_CB_Vector() returned PGSCSC_W_BELOW_SURFACE; bit 4: PGS_CBP_Sat_CB_Vector() returned PGSCBP_W_BAD_CB_VECTOR; bit 5: PGS_CBP_Sat_CB_Vector() returned PGSCBP_E_BAD_ARRAY_SIZE; bit 6: PGS_CBP_Sat_CB_Vector() returned PGSCBP_E_INVALID_CB_ID; bit 7: PGS_CBP_Sat_CB_Vector() returned PGSMEM_E_NO_MEMORY; bit 8: PGS_CBP_Sat_CB_Vector() returned PGSCBP_E_UNABLE_TO_OPEN_FILE; bit 9: PGS_CBP_Sat_CB_Vector() returned PGSTD_E_BAD_INITIAL_TIME; bit 10: PGS_CBP_Sat_CB_Vector() returned PGSCBP_E_TIME_OUT_OF_RANGE; bit 11: PGS_CBP_Sat_CB_Vector() returned PGSTD_E_SC_TAG_UNKNOWN; bit 12: PGS_CBP_Sat_CB_Vector() returned PGSEPH_E_BAD_EPHEM_FILE_HDR; bit 13: PGS_CBP_Sat_CB_Vector() returned PGSEPH_E_NO_SC_EPHEM_FILE; bit 14: PGS_CBP_Sat_CB_Vector() returned PGS_E_TOOLKIT; bit 15: not used |
| nadirTAI | 64-bit floating-point | None | TAI time at which instrument is nominally looking directly down. (between footprints 15 & 16 for AMSU or between footprints 45 & 46 for AIRS/Vis & HSB) (floating-point elapsed seconds since start of 1993) |
| sat_lat | 64-bit floating-point | None | Satellite geodetic latitude in degrees North (-90.0 ... 90.0) |
| sat_lon | 64-bit floating-point | None | Satellite geodetic longitude in degrees East (-180.0 ... 180.0) |
| scan_node_type | 8-bit integer | None | 'A' for ascending, 'D' for descending, 'N' for North-Polar, 'S' for South-Polar |
| glintlat | 32-bit floating-point | None | Solar glint geodetic latitude in degrees North at nadirTAI (-90.0 ... 90.0) |
| glintlon | 32-bit floating-point | None | Solar glint geodetic longitude in degrees East at nadirTAI (-180.0 ... 180.0) |

Size: 2565 bytes (0.0 MB) per 45-scanset granule

Full Swath Data Fields

These fields appear for every footprint of every scanline in the granule (GeoTrack * GeoXTrack times)

| Name | Type | Extra Dimensions | Explanation |
|-----------|-------------------------|------------------|--|
| RetQAFlag | 16-bit unsigned integer | None | Retrieval QA flags: users are advised not to use unless all bits are zero. bits 10-15: spare, set to zero.; bit 9 (value 512): retrieved ocean SST disagrees with NCEP forecast by at least 3 K; bit 8 (value 256): This record type not yet validated; bits 5-7: spare, set to zero; bit 4 (value 16): Final retrieval rejected or not attempted; bit 3 (value 8): Final Cloud Clearing rejected or not attempted; bit 2 (value 4): Regression First Guess rejected or not attempted; bit 1 (value 2): Initial Cloud Clearing rejected or not attempted; bit 0 (LSB, value 1): MW retrieval rejected or not attempted |
| ftptgeoqa | 32-bit unsigned integer | None | Footprint Geolocation QA flags: bit 0 (LSB): bad input value; bit 1: PGS_TD_TAtoUTC() returned PGSTD_E_NO_LEAP_SECS; bit 2: PGS_TD_TAtoUTC() returned PGS_E_TOOLKIT; bit 3: PGS_CSC_GetFOV_Pixel() returned PGSCSC_W_MISS_EARTH; bit 4: PGS_CSC_GetFOV_Pixel() returned PGSTD_E_SC_TAG_UNKNOWN; bit 5: PGS_CSC_GetFOV_Pixel() returned PGSCSC_W_ZERO_PIXEL_VECTOR; bit 6: PGS_CSC_GetFOV_Pixel() returned PGSCSC_W_BAD_EPHEM_FOR_PIXEL; bit 7: PGS_CSC_GetFOV_Pixel() returned PGSCSC_W_INSTRUMENT_OFF_BOARD; bit 8: PGS_CSC_GetFOV_Pixel() returned PGSCSC_W_BAD_ACCURACY_FLAG; bit 9: PGS_CSC_GetFOV_Pixel() returned PGSCSC_E_BAD_ARRAY_SIZE; bit 10: PGS_CSC_GetFOV_Pixel() returned PGSCSC_W_DEFAULT_EARTH_MODEL; bit 11: PGS_CSC_GetFOV_Pixel() returned PGSCSC_W_DATA_FILE_MISSING; bit 12: PGS_CSC_GetFOV_Pixel() returned PGSCSC_E_NEG_OR_ZERO_RAD; bit 13: PGS_CSC_GetFOV_Pixel() returned PGSMEM_E_NO_MEMORY; bit 14: PGS_CSC_GetFOV_Pixel() returned PGSTD_E_NO_LEAP_SECS; bit 15: PGS_CSC_GetFOV_Pixel() returned PGSTD_E_TIME_FMT_ERROR; bit 16: PGS_CSC_GetFOV_Pixel() returned PGSTD_E_TIME_VALUE_ERROR; bit 17: PGS_CSC_GetFOV_Pixel() returned PGSCSC_W_PREDICTED_UT1; bit 18: PGS_CSC_GetFOV_Pixel() returned PGSTD_E_NO_UT1_VALUE; bit 19: PGS_CSC_GetFOV_Pixel() returned |

| | | | |
|--------------------|-------------------------|------------------------------------|--|
| | | | PGS_E_TOOLKIT; bit 20: PGS_CSC_GetFOV_Pixel() returned PGSEPH_E_BAD_EPHEM_FILE_HDR; bit 21: PGS_CSC_GetFOV_Pixel() returned PGSEPH_E_NO_SC_EPHEM_FILE; bit 22-31: not used |
| zengeoqa | 16-bit unsigned integer | None | Satellite zenith Geolocation QA flags: bit 0 (LSB): (Spacecraft) bad input value; bit 1: PGS_CSC_ZenithAzimuth(S/C) returned PGSCSC_W_BELOW_HORIZON; bit 2: PGS_CSC_ZenithAzimuth(S/C) returned PGSCSC_W_UNDEFINED_AZIMUTH; bit 3: PGS_CSC_ZenithAzimuth(S/C) returned PGSCSC_W_NO_REFRACTION; bit 4: PGS_CSC_ZenithAzimuth(S/C) returned PGSCSC_E_INVALID_VECTAG; bit 5: PGS_CSC_ZenithAzimuth(S/C) returned PGSCSC_E_LOOK_PT_ALTIT_RANGE; bit 6: PGS_CSC_ZenithAzimuth(S/C) returned PGSCSC_E_ZERO_INPUT_VECTOR; bit 7: PGS_CSC_ZenithAzimuth(S/C) returned PGS_E_TOOLKIT; bit 8: (Sun) bad input value; bit 9: (suppressed) PGS_CSC_ZenithAzimuth(Sun) returned PGSCSC_W_BELOW_HORIZON (This is not an error condition - the sun is below the horizon at night); bit 10: PGS_CSC_ZenithAzimuth(Sun) returned PGSCSC_W_UNDEFINED_AZIMUTH; bit 11: PGS_CSC_ZenithAzimuth(Sun) returned PGSCSC_W_NO_REFRACTION; bit 12: PGS_CSC_ZenithAzimuth(Sun) returned PGSCSC_E_INVALID_VECTAG; bit 13: PGS_CSC_ZenithAzimuth(Sun) returned PGSCSC_E_LOOK_PT_ALTIT_RANGE; bit 14: PGS_CSC_ZenithAzimuth(Sun) returned PGSCSC_E_ZERO_INPUT_VECTOR; bit 15: PGS_CSC_ZenithAzimuth(Sun) returned PGS_E_TOOLKIT |
| demgeoqa | 16-bit unsigned integer | None | Digital Elevation Model (DEM) Geolocation QA flags: bit 0 (LSB): bad input value; bit 1: Could not allocate memory; bit 2: Too close to North or South pole. Excluded; bit 3: Layer resolution incompatibility. Excluded; bit 4: Any DEM Routine (elev) returned PGSDDEM_E_IMPROPER_TAG; bit 5: Any DEM Routine (elev) returned PGSDDEM_E_CANNOT_ACCESS_DATA; bit 6: Any DEM Routine (land/water) returned PGSDDEM_E_IMPROPER_TAG; bit 7: Any DEM Routine (land/water) returned PGSDDEM_E_CANNOT_ACCESS_DATA; bit 8: Reserved for future layers; bit 9: Reserved for future layers; bit 10: PGS_DEM_GetRegion(elev) returned PGSDDEM_M_FILLVALUE_INCLUDED; bit 11: PGS_DEM_GetRegion(land/water) returned PGSDDEM_M_FILLVALUE_INCLUDED; bit 12: Reserved for future layers; bit 13: PGS_DEM_GetRegion(all) returned PGSDDEM_M_MULTIPLE_RESOLUTIONS; bit 14: PGS_CSC_GetFOV_Pixel() returned any 'W' class return code except PGSCSC_W_PREDICTED_UT1; bit 15: PGS_CSC_GetFOV_Pixel() returned any 'E' class return code |
| satzen | 32-bit floating-point | None | Spacecraft zenith angle (0.0 ... 180.0) degrees from zenith (measured relative to the geodetic vertical on the reference (WGS84) spheroid and including corrections outlined in EOS SDP toolkit for normal accuracy.) |
| satazi | 32-bit floating-point | None | Spacecraft azimuth angle (-180.0 ... 180.0) degrees E of N GEO) |
| solzen | 32-bit floating-point | None | Solar zenith angle (0.0 ... 180.0) degrees from zenith (measured relative to the geodetic vertical on the reference (WGS84) spheroid and including corrections outlined in EOS SDP toolkit for normal accuracy.) |
| solazi | 32-bit floating-point | None | Solar azimuth angle (-180.0 ... 180.0) degrees E of N GEO) |
| sun_glint_distance | 16-bit integer | None | Distance (km) from footprint center to location of the sun glint (-9999 for unknown, 30000 for no glint visible because spacecraft is in Earth's shadow) |
| topog | 32-bit floating-point | None | Mean topography in meters above reference ellipsoid |
| topog_err | 32-bit floating-point | None | Error estimate for topog |
| landFrac | 32-bit floating-point | None | Fraction of spot that is land (0.0 ... 1.0) |
| landFrac_err | 32-bit floating-point | None | Error estimate for landFrac |
| latAIRS | 32-bit floating-point | AIRSTrack (= 3) * AIRSXTrack (= 3) | Geodetic center latitude of AIRS spots in degrees North (-90.0 ... 90.0) |
| lonAIRS | 32-bit floating-point | AIRSTrack (= 3) * AIRSXTrack (= 3) | Geodetic center longitude of AIRS spots in degrees East (-180.0 ... 180.0) |
| numHingeSurf | 16-bit integer | None | Number of IR hinge points for surface emissivity and reflectivity |
| numCloud | 32-bit integer | None | Number of cloud layers |
| freqEmis | 32-bit floating-point | HingeSurf (= 100) | Frequencies for surface emissivity and reflectivity in cm-1 (in order of increasing frequency. Only first numHingeSurf elements are valid) |
| PSurfStd | 32-bit floating-point | None | Surface pressure first guess in mb, interpolated from forecast |
| nSurfStd | 32-bit integer | None | Index in pressStd array of first pressure level above mean surface (25 ... 30) |
| TSurfStd | 32-bit floating-point | None | Surface skin temperature in Kelvins |
| TSurfAir | 32-bit floating-point | None | Surface air temperature in Kelvins |
| TAirStd | 32-bit floating-point | StdPressureLev (= 28) | Atmospheric Temperature at StdPressLev in Kelvins |
| H2OMMRStd | 32-bit | StdPressureLev (= 28) | Water Vapor Mass Mixing Ratio (gm / kg dry air) |

| | | | |
|---------------------|-----------------------|--|---|
| | floating-point | 28) | |
| H2OMMRStd | 32-bit floating-point | StdPressureLev (= 28) | Water vapor saturation mass mixing ratio (gm / kg dry air) |
| totH2OStd | 32-bit floating-point | None | Total precipitable water vapor (kg / m**2) |
| O3VMRStd | 32-bit floating-point | StdPressureLev (= 28) | Ozone Volume Mixing Ratio (vmr) |
| totO3Std | 32-bit floating-point | None | Total ozone burden (Dobson units) |
| emisIRStd | 32-bit floating-point | HingeSurf (= 100) | Spectral IR Surface Emissivities (in order of increasing frequency. Only first numHingeSurf elements are valid) |
| rhoIRStd | 32-bit floating-point | HingeSurf (= 100) | Spectral IR Bidirectional Surface Reflectivities (in order of increasing frequency. Only first numHingeSurf elements are valid) |
| sfcTbMWStd | 32-bit floating-point | MWHingeSurf (= 7) | Microwave surface brightness (Kelvins) (Emitted radiance only; reflected radiance not included) |
| EmisMWStd | 32-bit floating-point | MWHingeSurf (= 7) | Spectral emissivity at the 7 MW frequencies listed for dimension MWHingeSurf (sfcTbMWStd / TSurfStd, or Undefined if IR fails) |
| totCldH2OStd | 32-bit floating-point | None | Total cloud liquid water in kg/m**2 |
| TCldTopStd | 32-bit floating-point | Cloud (= 2) | Cloud top temperature in Kelvins (in order of increasing pressure. Only first numCloud elements are valid) |
| PCldTopStd | 32-bit floating-point | Cloud (= 2) | Cloud top pressure in mb |
| CldFrcStd | 32-bit floating-point | AIRSTrack (= 3) * AIRSXTrack (= 3) * Cloud (= 2) | Cloud fraction (0.0 ... 1.0) assuming the cloud emissivity at 930 cm-1 is unity (in order of increasing pressure. Only first numCloud elements are valid) |
| CldClearParamStd | 32-bit floating-point | Eta (= 9) | Cloud clearing parameter Eta |
| PSurfStdErr | 32-bit floating-point | None | Error estimate for PSurfStd |
| TSurfStdErr | 32-bit floating-point | None | Error estimate for TSurfStd |
| TAirStdErr | 32-bit floating-point | StdPressureLev (= 28) | Error estimate for TAirStd |
| H2OMMRStdErr | 32-bit floating-point | StdPressureLev (= 28) | Error estimate for H2OMMRStd |
| totH2OStdErr | 32-bit floating-point | None | Error estimate for totH2OStd |
| O3VMRStdErr | 32-bit floating-point | StdPressureLev (= 28) | Error estimate for O3VMRStd |
| totO3StdErr | 32-bit floating-point | None | Error estimate for totO3Std |
| emisIRStdErr | 32-bit floating-point | HingeSurf (= 100) | Error estimate for emisIRStd |
| rhoIRStdErr | 32-bit floating-point | HingeSurf (= 100) | Error estimate for rhoIRStd |
| EmisMWStdErr | 32-bit floating-point | MWHingeSurf (= 7) | Error estimate for EmisMWStd |
| totCldH2OStdErr | 32-bit floating-point | None | Error estimate for totCldH2OStd |
| TCldTopStdErr | 32-bit floating-point | Cloud (= 2) | Error estimate for TCldTopStd |
| PCldTopStdErr | 32-bit floating-point | Cloud (= 2) | Error estimate for PCldTopStd |
| CldFrcStdErr | 32-bit floating-point | AIRSTrack (= 3) * AIRSXTrack (= 3) * Cloud (= 2) | Error estimate for CldFrcStd |
| CldClearParamStdErr | 32-bit floating-point | Eta (= 9) | Error estimate for CldClearParamStd |
| GP_Height | 32-bit floating-point | StdPressureLev (= 28) | Geopotential Heights at StdPressureLev (m above mean sea level) |
| GP_Surface | 32-bit floating-point | None | Geopotential Height of surface (m above mean sea level) |
| clear_flag_4um | 8-bit integer | AIRSTrack (= 3) * | Clear flag based on level of agreement of predicted SST using AIRS 4 microns /2616 |

| | | | |
|-----------------|---------------|------------------------------------|---|
| | | AIRSXTrack (= 3) | & 2707 cm ⁻¹) observations with SST from a forecast model combined with a spatial homogeneity test of brightness temperature at 2616 cm ⁻¹ over 3X3 AIRS footprints. 1: believed clear; 0: clear test failed or inconclusive; -1/255: clear test not attempted. |
| clear_flag_11um | 8-bit integer | AIRSTrack (= 3) * AIRSXTrack (= 3) | Clear flag based on level of agreement of predicted SST using AIRS 11 microns split window observations with SST from a forecast model combined with a spatial homogeneity test of the SST agreement described above over 3X3 AIRS footprints. 1: believed clear; 0: clear test failed or inconclusive; -1/255: clear test not attempted. |
| invalid | 8-bit integer | None | No valid output (1: True, 0: False, 255/-1: Unknown) |
| clear_flag | 8-bit integer | None | 1 for 100% clear, 0 for |
| MW_ret_used | 8-bit integer | None | MW-only final retrieval used (1: True, 0: False, 255/-1: Unknown) |
| retrieval_type | 8-bit integer | None | Deprecated -- use RetQAFlag. Retrieval type: 0 for full retrieval; 10 for MW + final succeeded, initial retrieval failed; 20 for MW + initial succeeded, final failed; 30 for only MW stage succeeded, initial + final retrieval failed; 40 for MW + initial succeeded, final cloud-clearing failed; 50 for only MW stage succeeded, initial + final cloud-clearing failed; 100 for no retrieval; |

Size: 4622400 bytes (4.6 MB) per 45-scanset granule

**Total File Size (plus storage for dimensions and other HDF-EOS overhead):
4657659 bytes (4.7 MB) per 45-scanset granule = 1117.8 MB per day**

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A1-16. L2 Standard Cloud-Cleared Radiance Product Interface Specification

Interface Specification Version 3.0.4.0
2003-05-19

ESDT ShortName = "AIRI2CCF"

Swath Name = "L2_Standard_cloud-cleared_radiance_product"

Level = "level2"

Footprints = 30

scanlines per scanset = 1

Dimensions

These fields define all dimensions that can be used for HDF-EOS swath fields.

The names "GeoTrack" and "GeoXTrack" have a special meaning for this document: "Cross-Track" data fields have a hidden dimension of "GeoXTrack"; "Along-Track" data fields have a hidden dimension of "GeoTrack"; "Full Swath Data Fields have hidden dimensions of both "GeoTrack" and "GeoXTrack".

| Name | Value | Explanation |
|-----------|--------------------------|---|
| GeoXTrack | 30 | Dimension across track for footprint positions. Same as number of footprints per scanline. -- starting at the left and increasing towards the right as you look along the satellite's path |
| GeoTrack | # of scan lines in swath | Dimension along track for footprint positions. Same as number of scanlines in granule. Parallel to the satellite's path, increasing with time. (Nominally 45 for Level-2, AMSU-A, and AIRS/Vis low-rate engineering; 135 for AIRS/Vis and HSB high-rate quantities) |
| Channel | 2378 | Dimension of channel array (Channels are generally in order of increasing wavenumber, but because frequencies can vary and because all detectors from a physical array of detector elements (a "module") are always grouped together there are sometimes small reversals in frequency order where modules overlap.) |

Geolocation Fields

These fields appear for every footprint (GeoTrack * GeoXTrack times) and correspond to footprint center coordinates and "shutter" time.

| Name | Explanation |
|-----------|--|
| Latitude | Footprint boresight geodetic Latitude in degrees North (-90.0 ... 90.0) |
| Longitude | Footprint boresight geodetic Longitude in degrees East (-180.0 ... 180.0) |
| Time | Footprint "shutter" TAI Time: floating-point elapsed seconds since Jan 1, 1993 |

Size: 32400 bytes (0.0 MB) per 45-scanset granule

Attributes

These fields appear only once per granule

| Name | Type | Extra Dimensions | Explanation |
|------------------|----------------------------|------------------|---|
| freq | 32-bit floating-point | Channel (= 2378) | Frequencies associated with each channel (in cm**-1) |
| processing_level | string of 8-bit characters | None | Zero-terminated character string denoting processing level ("level2") |
| instrument | string of 8-bit characters | None | Zero-terminated character string denoting instrument ("AIRS") |
| DayNightFlag | string of 8-bit characters | None | Zero-terminated character string denoting granule as day and/or night: (Always "Day", "Night", or "Both") |
| AutomaticQAFlag | string of 8-bit characters | None | Zero-terminated character string denoting granule data quality: (Always "Passed", "Failed", or "Suspect") |
| NumTotalData | 32-bit integer | None | Total number of expected scene footprints |
| NumProcessData | 32-bit integer | None | Number of scene footprints which are present and can be processed routinely (state = 0) |
| NumSpecialData | 32-bit integer | None | Number of scene footprints which are present and can be processed only as a special test (state = 1) |
| NumBadData | 32-bit integer | None | Number of scene footprints which are present but cannot be processed (state = 2) |
| NumMissingData | 32-bit integer | None | Number of expected scene footprints which are not present (state = 3) |

| | | | |
|-----------------|----------------------------|------|---|
| NumLandSurface | 32-bit integer | None | Number of scene footprints for which the surface is more than 90% land |
| NumOceanSurface | 32-bit integer | None | Number of scene footprints for which the surface is less than 10% land |
| node_type | string of 8-bit characters | None | Zero-terminated character string denoting whether granule is ascending, descending, or pole-crossing: ("Ascending" and "Descending" for entirely ascending or entirely descending granules, or "NorthPole" or "SouthPole" for pole-crossing granules) |
| start_year | 32-bit integer | None | Year in which granule started, UTC (e.g. 1999) |
| start_month | 32-bit integer | None | Month in which granule started, UTC (1 ... 12) |
| start_day | 32-bit integer | None | Day of month in which granule started, UTC (1 ... 31) |
| start_hour | 32-bit integer | None | Hour of day in which granule started, UTC (0 ... 23) |
| start_minute | 32-bit integer | None | Minute of hour in which granule started, UTC (0 ... 59) |
| start_sec | 32-bit floating-point | None | Second of minute in which granule started, UTC (0.0 ... 59.0) |
| start_orbit | 32-bit integer | None | Orbit number of mission in which granule started |
| end_orbit | 32-bit integer | None | Orbit number of mission in which granule ended |
| orbit_path | 32-bit integer | None | Orbit path of start orbit (1 ... 233 as defined by EOS project) |
| start_orbit_row | 32-bit integer | None | Orbit row at start of granule (1 ... 248 as defined by EOS project) |
| end_orbit_row | 32-bit integer | None | Orbit row at end of granule (1 ... 248 as defined by EOS project) |
| granule_number | 32-bit integer | None | Number of granule within day (1 ... 240) |
| num_scansets | 32-bit integer | None | Number of scansets in granule (1 ... 45) |
| num_scanlines | 32-bit integer | None | Number of scanlines in granule (3 * num_scansets) |
| start_Latitude | 64-bit floating-point | None | Geodetic Latitude of spacecraft at start of granule in degrees North (-90.0 ... 90.0) |
| start_Longitude | 64-bit floating-point | None | Geodetic Longitude of spacecraft at start of granule in degrees East (-180.0 ... 180.0) |
| start_Time | 64-bit floating-point | None | TAI Time at start of granule (floating-point elapsed seconds since start of 1993) |
| end_Latitude | 64-bit floating-point | None | Geodetic Latitude of spacecraft at end of granule in degrees North (-90.0 ... 90.0) |
| end_Longitude | 64-bit floating-point | None | Geodetic Longitude of spacecraft at end of granule in degrees East (-180.0 ... 180.0) |
| end_Time | 64-bit floating-point | None | TAI Time at end of granule (floating-point elapsed seconds since start of 1993) |
| eq_x_longitude | 32-bit floating-point | None | Longitude of spacecraft at southward equator crossing nearest granule start in degrees East (-180.0 ... 180.0) |
| eq_x_tai | 64-bit floating-point | None | Time of eq_x_longitude in TAI units (floating-point elapsed seconds since start of 1993) |
| orbitgeoqa | 32-bit unsigned integer | None | Orbit Geolocation QA: bit 0 (LSB): bad input value (last scanline); bit 1: bad input value (first scanline); bit 2: PGS_EPH_GetEphMet() returned PGSEPH_E_NO_SC_EPHEM_FILE; bit 3: PGS_EPH_GetEphMet() returned PGSEPH_E_BAD_ARRAY_SIZE; bit 4: PGS_EPH_GetEphMet() returned PGSTD_E_TIME_FMT_ERROR; bit 5: PGS_EPH_GetEphMet() returned PGSTD_E_TIME_VALUE_ERROR; bit 6: PGS_EPH_GetEphMet() returned PGSTD_E_SC_TAG_UNKNOWN; bit 7: PGS_EPH_GetEphMet() returned PGS_E_TOOLKIT; bit 8: PGS_TD_UTCtoTAI() returned PGSTD_E_NO_LEAP_SECS; bit 9: PGS_TD_UTCtoTAI() returned PGSTD_E_TIME_FMT_ERROR; bit 10: PGS_TD_UTCtoTAI() returned PGSTD_E_TIME_VALUE_ERROR; bit 11: PGS_TD_UTCtoTAI() returned PGS_E_TOOLKIT; bit 12: PGS_CSC_DayNight() returned PGSCSC_E_INVALID_LIMITTAG; bit 13: PGS_CSC_DayNight() returned PGSCSC_E_BAD_ARRAY_SIZE; bit 14: PGS_CSC_DayNight() returned PGSCSC_W_ERROR_IN_DAYNIGHT; bit 15: PGS_CSC_DayNight() returned PGSCSC_W_BAD_TRANSFORM_VALUE; bit 16: PGS_CSC_DayNight() returned PGSCSC_W_BELOW_HORIZON; bit 17: PGS_CSC_DayNight() returned PGSCSC_W_PREDICTED_UT1; bit 18: PGS_CSC_DayNight() returned PGSTD_E_NO_UT1_VALUE; bit 19: PGS_CSC_DayNight() returned PGSTD_E_BAD_INITIAL_TIME; bit 20: PGS_CSC_DayNight() returned PGSCBP_E_TIME_OUT_OF_RANGE; bit 21: PGS_CSC_DayNight() returned PGSCBP_E_UNABLE_TO_OPEN_FILE; bit 22: PGS_CSC_DayNight() returned PGSMEM_E_NO_MEMORY; bit 23: PGS_CSC_DayNight() returned PGS_E_TOOLKIT; bit 24-31: not used |
| num_satgeoqa | 16-bit integer | None | Number of scans with problems in satgeoqa |
| num_glintgeoqa | 16-bit integer | None | Number of scans with problems in glintgeoqa |
| num_moongeoqa | 16-bit integer | None | Number of scans with problems in moongeoqa |
| num_ftptgeoqa | 16-bit integer | None | Number of footprints with problems in ftptgeoqa |
| num_zengeoqa | 16-bit integer | None | Number of footprints with problems in zengeoqa |

| | | | |
|--------------------|----------------|------|---|
| num_demgeoqa | 16-bit integer | None | Number of footprints with problems in demgeoqa |
| num_fpe | 16-bit integer | None | Number of floating point errors |
| LonGranuleCen | 16-bit integer | None | Geodetic Longitude of the center of the granule in degrees East (-180 ... 180) |
| LatGranuleCen | 16-bit integer | None | Geodetic Latitude of the center of the granule in degrees North (-90 ... 90) |
| LocTimeGranuleCen | 16-bit integer | None | Local solar time at the center of the granule in minutes past midnight (0 ... 1439) |
| num_invalid | 16-bit integer | None | # of footprints where invalid is True |
| num_clear_flag | 16-bit integer | None | # of footprints 100% clear |
| num_MW_ret_used | 16-bit integer | None | # of footprints where MW-only final retrieval used |
| num_retrieval_type | 16-bit integer | None | # of footprints without full retrieval |

Size: 9693 bytes (0.0 MB) per granule

Along-Track Data Fields

These fields appear once per scanline (GeoTrack times)

| Name | Type | Extra Dimensions | Explanation |
|------------|-------------------------|------------------|--|
| satheight | 32-bit floating-point | None | Satellite altitude at nadirTAI in km above reference ellipsoid (e.g. 725.2) |
| satroll | 32-bit floating-point | None | Satellite attitude roll angle at nadirTAI (-180.0 ... 180.0 angle about the +x (roll) ORB axis, +x axis is positively oriented in the direction of orbital flight completing an orthogonal triad with y and z.) |
| satpitch | 32-bit floating-point | None | Satellite attitude pitch angle at nadirTAI (-180.0 ... 180.0 angle about +y (pitch) ORB axis. +y axis is oriented normal to the orbit plane with the positive sense opposite to that of the orbit's angular momentum vector H.) |
| satyaw | 32-bit floating-point | None | Satellite attitude yaw angle at nadirTAI (-180.0 ... 180.0 angle about +z (yaw) axis. +z axis is positively oriented earthward parallel to the satellite radius vector R from the spacecraft center of mass to the center of the Earth.) |
| satgeoqa | 32-bit unsigned integer | None | Satellite Geolocation QA flags: bit 0 (LSB): bad input value; bit 1: PGS_TD_TAItUTC() returned PGSTD_E_NO_LEAP_SECS; bit 2: PGS_TD_TAItUTC() returned PGS_E_TOOLKIT; bit 3: PGS_EPH_EphemAttit() returned PGSEPH_W_BAD_EPHEM_VALUE; bit 4: PGS_EPH_EphemAttit() returned PGSEPH_E_BAD_EPHEM_FILE_HDR; bit 5: PGS_EPH_EphemAttit() returned PGSEPH_E_NO_SC_EPHEM_FILE; bit 6: PGS_EPH_EphemAttit() returned PGSEPH_E_NO_DATA_REQUESTED; bit 7: PGS_EPH_EphemAttit() returned PGSTD_E_SC_TAG_UNKNOWN; bit 8: PGS_EPH_EphemAttit() returned PGSEPH_E_BAD_ARRAY_SIZE; bit 9: PGS_EPH_EphemAttit() returned PGSTD_E_TIME_FMT_ERROR; bit 10: PGS_EPH_EphemAttit() returned PGSTD_E_TIME_VALUE_ERROR; bit 11: PGS_EPH_EphemAttit() returned PGSTD_E_NO_LEAP_SECS; bit 12: PGS_EPH_EphemAttit() returned PGS_E_TOOLKIT; bit 13: PGS_CSC_ECIttoECR() returned PGSCSC_W_BAD_TRANSFORM_VALUE; bit 14: PGS_CSC_ECIttoECR() returned PGSCSC_E_BAD_ARRAY_SIZE; bit 15: PGS_CSC_ECIttoECR() returned PGSTD_E_NO_LEAP_SECS; bit 16: PGS_CSC_ECIttoECR() returned PGSTD_E_TIME_FMT_ERROR; bit 17: PGS_CSC_ECIttoECR() returned PGSTD_E_TIME_VALUE_ERROR; bit 18: unused (set to zero); bit 19: PGS_CSC_ECIttoECR() returned PGSTD_E_NO_UT1_VALUE; bit 20: PGS_CSC_ECIttoECR() returned PGS_E_TOOLKIT; bit 21: PGS_CSC_ECRtoGEO() returned PGSCSC_W_TOO_MANY_ITERS; bit 22: PGS_CSC_ECRtoGEO() returned PGSCSC_W_INVALID_ALTITUDE; bit 23: PGS_CSC_ECRtoGEO() returned PGSCSC_W_SPHERE_BODY; bit 24: PGS_CSC_ECRtoGEO() returned PGSCSC_W_LARGE_FLATTENING; bit 25: PGS_CSC_ECRtoGEO() returned PGSCSC_W_DEFAULT_EARTH_MODEL; bit 26: PGS_CSC_ECRtoGEO() returned PGSCSC_E_BAD_EARTH_MODEL; bit 27: PGS_CSC_ECRtoGEO() returned PGS_E_TOOLKIT; bit 28-31: not used |
| glintgeoqa | 16-bit unsigned integer | None | Glint Geolocation QA flags: bit 0 (LSB): bad input value; bit 1: glint location in Earth's shadow; bit 2: glint calculation not converging; bit 3: glint location sun vs. satellite zenith mismatch; bit 4: glint location sun vs. satellite azimuth mismatch; bit 5: bad glint location; bit 6: PGS_CSC_ZenithAzimuth() returned any 'W' class return code; bit 7: PGS_CSC_ZenithAzimuth() returned any 'E' class return code; bit 8: PGS_CBP_Earth_CB_Vector() returned returned any 'W' class return code; bit 9: PGS_CBP_Earth_CB_Vector() returned returned any 'E' class return code; bit 10: PGS_CSC_ECIttoECR() returned any 'W' class return code except PGSCSC_W_PREDICTED_UT1 (for Glint); bit 11: PGS_CSC_ECIttoECR() returned any 'E' class return code (for Glint); bit 12: PGS_CSC_ECRtoGEO() returned any 'W' class return code (for Glint); bit 13: PGS_CSC_ECRtoGEO() returned any 'E' class return code (for Glint); bit 14: PGS_CSC_ECIttoECR() returned any 'W' class return code except PGSCSC_W_PREDICTED_UT1; bit 15: PGS_CSC_ECIttoECR() returned any 'E' class return code |
| moongeoqa | 16-bit unsigned integer | None | Moon Geolocation QA flags: bit 0 (LSB): bad input value; bit 1: PGS_TD_TAItUTC() returned PGSTD_E_NO_LEAP_SECS; bit 2: PGS_TD_TAItUTC() returned PGS_E_TOOLKIT; bit 3: PGS_CBP_Sat_CB_Vector() returned PGSCBP_W_BELOW_SURFACE; bit 4: PGS_CBP_Sat_CB_Vector() returned PGSCBP_W_BAD_CB_VECTOR; bit 5: PGS_CBP_Sat_CB_Vector() returned PGSCBP_E_BAD_ARRAY_SIZE; bit 6: PGS_CBP_Sat_CB_Vector() returned PGSCBP_E_INVALID_CB_ID; bit 7: PGS_CBP_Sat_CB_Vector() returned PGSMEM_E_NO_MEMORY; bit 8: PGS_CBP_Sat_CB_Vector() returned PGSCBP_E_UNABLE_TO_OPEN_FILE; bit 9: PGS_CBP_Sat_CB_Vector() returned PGSTD_E_BAD_INITIAL_TIME; bit 10: PGS_CBP_Sat_CB_Vector() returned PGSCBP_E_TIME_OUT_OF_RANGE; bit 11: PGS_CBP_Sat_CB_Vector() returned PGSTD_F_SC_TAG_UNKNOWN; bit 12: |

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|----------------|-----------------------|------|--|
| | | | PGS_CBP_Sat_CB_Vector() returned PGSEPH_E_BAD_EPHEM_FILE_HDR; bit 13: PGS_CBP_Sat_CB_Vector() returned PGSEPH_E_NO_SC_EPHEM_FILE; bit 14: PGS_CBP_Sat_CB_Vector() returned PGS_E_TOOLKIT; bit 15: not used |
| nadirTAI | 64-bit floating-point | None | TAI time at which instrument is nominally looking directly down. (between footprints 15 & 16 for AMSU or between footprints 45 & 46 for AIRS/Vis & HSB) (floating-point elapsed seconds since start of 1993) |
| sat_lat | 64-bit floating-point | None | Satellite geodetic latitude in degrees North (-90.0 ... 90.0) |
| sat_lon | 64-bit floating-point | None | Satellite geodetic longitude in degrees East (-180.0 ... 180.0) |
| scan_node_type | 8-bit integer | None | 'A' for ascending, 'D' for descending, 'N' for North-Polar, 'S' for South-Polar |
| glintlat | 32-bit floating-point | None | Solar glint geodetic latitude in degrees North at nadirTAI (-90.0 ... 90.0) |
| glintlon | 32-bit floating-point | None | Solar glint geodetic longitude in degrees East at nadirTAI (-180.0 ... 180.0) |

Size: 2565 bytes (0.0 MB) per 45-scanset granule

Full Swath Data Fields

These fields appear for every footprint of every scanline in the granule (GeoTrack * GeoXTrack times)

| Name | Type | Extra Dimensions | Explanation |
|--------------|-------------------------|------------------|--|
| RetQAFlag | 16-bit unsigned integer | None | Retrieval QA flags: users are advised not to use unless all bits are zero. bits 10-15: spare, set to zero.; bit 9 (value 512): retrieved ocean SST disagrees with NCEP forecast by at least 3 K; bit 8 (value 256): This record type not yet validated; bits 5-7: spare, set to zero; bit 4 (value 16): Final retrieval rejected or not attempted; bit 3 (value 8): Final Cloud Clearing rejected or not attempted; bit 2 (value 4): Regression First Guess rejected or not attempted; bit 1 (value 2): Initial Cloud Clearing rejected or not attempted; bit 0 (LSB, value 1): MW retrieval rejected or not attempted |
| radiances | 32-bit floating-point | Channel (= 2378) | Cloud-cleared radiances for each channel in milliWatts/m**2/cm**-1/steradian |
| radiance_err | 32-bit floating-point | Channel (= 2378) | Error estimate for radiances (milliWatts/m**2/cm**-1/steradian) |
| scanang | 32-bit floating-point | None | Scanning angle of AIRS instrument with respect to the spacecraft for this footprint (-180.0 ... 180.0, negative at start of scan, 0 at nadir) |
| ftptgeoqa | 32-bit unsigned integer | None | Footprint Geolocation QA flags: bit 0 (LSB): bad input value; bit 1: PGS_TD_TAItoUTC() returned PGSTD_E_NO_LEAP_SECS; bit 2: PGS_TD_TAItoUTC() returned PGS_E_TOOLKIT; bit 3: PGS_CSC_GetFOV_Pixel() returned PGSCSC_W_MISS_EARTH; bit 4: PGS_CSC_GetFOV_Pixel() returned PGSTD_E_SC_TAG_UNKNOWN; bit 5: PGS_CSC_GetFOV_Pixel() returned PGSCSC_W_ZERO_PIXEL_VECTOR; bit 6: PGS_CSC_GetFOV_Pixel() returned PGSCSC_W_BAD_EPHEM_FILE_HDR; bit 7: PGS_CSC_GetFOV_Pixel() returned PGSCSC_W_INSTRUMENT_OFF_BOARD; bit 8: PGS_CSC_GetFOV_Pixel() returned PGSCSC_W_BAD_ACCURACY_FLAG; bit 9: PGS_CSC_GetFOV_Pixel() returned PGSCSC_E_BAD_ARRAY_SIZE; bit 10: PGS_CSC_GetFOV_Pixel() returned PGSCSC_W_DEFAULT_EARTH_MODEL; bit 11: PGS_CSC_GetFOV_Pixel() returned PGSCSC_W_DATA_FILE_MISSING; bit 12: PGS_CSC_GetFOV_Pixel() returned PGSCSC_E_NEG_OR_ZERO_RAD; bit 13: PGS_CSC_GetFOV_Pixel() returned PGSMEM_E_NO_MEMORY; bit 14: PGS_CSC_GetFOV_Pixel() returned PGSTD_E_NO_LEAP_SECS; bit 15: PGS_CSC_GetFOV_Pixel() returned PGSTD_E_TIME_FMT_ERROR; bit 16: PGS_CSC_GetFOV_Pixel() returned PGSTD_E_TIME_VALUE_ERROR; bit 17: PGS_CSC_GetFOV_Pixel() returned PGSCSC_W_PREDICTED_UT1; bit 18: PGS_CSC_GetFOV_Pixel() returned PGSTD_E_NO_UT1_VALUE; bit 19: PGS_CSC_GetFOV_Pixel() returned PGS_E_TOOLKIT; bit 20: PGS_CSC_GetFOV_Pixel() returned PGSEPH_E_BAD_EPHEM_FILE_HDR; bit 21: PGS_CSC_GetFOV_Pixel() returned PGSEPH_E_NO_SC_EPHEM_FILE; bit 22-31: not used |
| zengeoqa | 16-bit unsigned integer | None | Satellite zenith Geolocation QA flags: bit 0 (LSB): (Spacecraft) bad input value; bit 1: PGS_CSC_ZenithAzimuth(S/C) returned PGSCSC_W_BELOW_HORIZON; bit 2: PGS_CSC_ZenithAzimuth(S/C) returned PGSCSC_W_UNDEFINED_AZIMUTH; bit 3: PGS_CSC_ZenithAzimuth(S/C) returned PGSCSC_W_NO_REFRACTION; bit 4: PGS_CSC_ZenithAzimuth(S/C) returned PGSCSC_E_INVALID_VECTAG; bit 5: PGS_CSC_ZenithAzimuth(S/C) returned PGSCSC_E_LOOK_PT_ALTIT_RANGE; bit 6: PGS_CSC_ZenithAzimuth(S/C) returned PGSCSC_E_ZERO_INPUT_VECTOR; bit 7: PGS_CSC_ZenithAzimuth(S/C) returned PGS_E_TOOLKIT; bit 8: (Sun) bad input value; bit 9: (suppressed) PGS_CSC_ZenithAzimuth(Sun) returned PGSCSC_W_BELOW_HORIZON (This is not an error condition - the sun is below the horizon at night); bit 10: PGS_CSC_ZenithAzimuth(Sun) returned PGSCSC_W_UNDEFINED_AZIMUTH; bit 11: PGS_CSC_ZenithAzimuth(Sun) returned PGSCSC_W_NO_REFRACTION; bit 12: PGS_CSC_ZenithAzimuth(Sun) returned PGSCSC_E_INVALID_VECTAG; bit 13: PGS_CSC_ZenithAzimuth(Sun) returned PGSCSC_E_LOOK_PT_ALTIT_RANGE; bit 14: PGS_CSC_ZenithAzimuth(Sun) returned PGSCSC_E_ZERO_INPUT_VECTOR; bit 15: PGS_CSC_ZenithAzimuth(Sun) returned PGS_E_TOOLKIT |
| demgeoqa | 16-bit unsigned integer | None | Digital Elevation Model (DEM) Geolocation QA flags: bit 0 (LSB): bad input value; bit 1: Could not allocate memory; bit 2: Too close to North or South pole. Excluded; bit 3: Layer resolution incompatibility. Excluded; bit 4: Any DEM Routine (elev) returned PGSDDEM_E_IMPROPER_TAG; bit 5: Any DEM Routine (elev) returned PGSDDEM_E_CANNOT_ACCESS_DATA; bit 6: Any DEM Routine (land/water) returned PGSDDEM_E_IMPROPER_TAG; bit 7: Any DEM Routine (land/water) returned |

| | | | |
|--------------------|-----------------------|------|--|
| | | | PGSDEM_E_CANNOT_ACCESS_DATA; bit 8: Reserved for future layers; bit 9: Reserved for future layers; bit 10: PGS_DEM_GetRegion(elev) returned PGSDEM_M_FILLVALUE_INCLUDED; bit 11: PGS_DEM_GetRegion(land/water) returned PGSDEM_M_FILLVALUE_INCLUDED; bit 12: Reserved for future layers; bit 13: PGS_DEM_GetRegion(all) returned PGSDEM_M_MULTIPLE_RESOLUTIONS; bit 14: PGS_CSC_GetFOV_Pixel() returned any 'W' class return code except PGSCSC_W_PREDICTED_UT1; bit 15: PGS_CSC_GetFOV_Pixel() returned any 'E' class return code |
| satzen | 32-bit floating-point | None | Spacecraft zenith angle (0.0 ... 180.0) degrees from zenith (measured relative to the geodetic vertical on the reference (WGS84) spheroid and including corrections outlined in EOS SDP toolkit for normal accuracy.) |
| satazi | 32-bit floating-point | None | Spacecraft azimuth angle (-180.0 ... 180.0) degrees E of N GEO) |
| solzen | 32-bit floating-point | None | Solar zenith angle (0.0 ... 180.0) degrees from zenith (measured relative to the geodetic vertical on the reference (WGS84) spheroid and including corrections outlined in EOS SDP toolkit for normal accuracy.) |
| solazi | 32-bit floating-point | None | Solar azimuth angle (-180.0 ... 180.0) degrees E of N GEO) |
| sun_glint_distance | 16-bit integer | None | Distance (km) from footprint center to location of the sun glint (-9999 for unknown, 30000 for no glint visible because spacecraft is in Earth's shadow) |
| topog | 32-bit floating-point | None | Mean topography in meters above reference ellipsoid |
| topog_err | 32-bit floating-point | None | Error estimate for topog |
| landFrac | 32-bit floating-point | None | Fraction of spot that is land (0.0 ... 1.0) |
| landFrac_err | 32-bit floating-point | None | Error estimate for landFrac |
| invalid | 8-bit integer | None | No valid output (1: True, 0: False, 255/-1: Unknown) |
| clear_flag | 8-bit integer | None | 1 for 100% clear, 0 for |
| MW_ret_used | 8-bit integer | None | MW-only final retrieval used (1: True, 0: False, 255/-1: Unknown) |
| retrieval_type | 8-bit integer | None | Deprecated -- use RetQAFlag. Retrieval type: 0 for full retrieval; 10 for MW + final succeeded, initial retrieval failed; 20 for MW + initial succeeded, final failed; 30 for only MW stage succeeded, initial + final retrieval failed; 40 for MW + initial succeeded, final cloud-clearing failed; 50 for only MW stage succeeded, initial + final cloud-clearing failed; 100 for no retrieval; |

Size: 25752600 bytes (25.8 MB) per 45-scanset granule

**Total File Size (plus storage for dimensions and other HDF-EOS overhead):
25797258 bytes (25.8 MB) per 45-scanset granule = 6191.3 MB per day**

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A1-17. L2 Support Atmospheric/Surface Product Interface Specification

Interface Specification Version 3.0.4.0
2003-05-19

ESDT ShortName = "AIRX2SUP"

Swath Name = "L2_Support_atmospheric&surface_product"

Level = "level2"

Footprints = 30

scanlines per scanset = 1

Dimensions

These fields define all dimensions that can be used for HDF-EOS swath fields.

The names "GeoTrack" and "GeoXTrack" have a special meaning for this document: "Cross-Track" data fields have a hidden dimension of "GeoXTrack"; "Along-Track" data fields have a hidden dimension of "GeoTrack"; "Full Swath Data Fields have hidden dimensions of both "GeoTrack" and "GeoXTrack".

| Name | Value | Explanation |
|-----------------|--------------------------|---|
| GeoXTrack | 30 | Dimension across track for footprint positions. Same as number of footprints per scanline. -- starting at the left and increasing towards the right as you look along the satellite's path |
| GeoTrack | # of scan lines in swath | Dimension along track for footprint positions. Same as number of scanlines in granule. Parallel to the satellite's path, increasing with time. (Nominally 45 for Level-2, AMSU-A, and AIRS/Vis low-rate engineering; 135 for AIRS/Vis and HSB high-rate quantities) |
| StdPressureLev | 28 | Number of standard pressure altitude levels (from bottom of the atmosphere up) |
| StdPressureLay | 28 | Number of standard pressure altitude layers (Always equal to StdPressureLev: last layer goes from level 1 to the top of the atmosphere) |
| AIRSXTrack | 3 | The number of AIRS cross-track spots per AMSU-A spot. Direction is the same as GeoXTrack -- starting at the left and increasing towards the right as you look along the satellite's path |
| AIRSTrack | 3 | The number of AIRS along-track spots per AMSU-A spot. Direction is the same as GeoTrack -- parallel to the satellite's path, increasing with time |
| Cloud | 2 | Cloud layer dimension in order of increasing pressure. Only first numCloud elements are valid |
| ChanAMSUA | 15 | Dimension of AMSU-A Channel array (Channel 1: 23.8 GHz; Ch 2: 31.4 GHz; Ch 3: 50.3 GHz; Ch 4: 52.8 GHz; Ch 5: 53.596 +/- 0.115 GHz; Ch 6: 54.4 GHz; Ch 7: 54.94 GHz; Ch 8: 55.5 GHz; Ch 9: f0; Ch 10: f0 +/- 0.217 GHz Ch 11: f0 +/- df +/- 48 MHz; Ch 12: f0 +/- df +/- 22 MHz; Ch 13: f0 +/- df +/- 10 MHz; Ch 14: f0 +/- df +/- 4.5 MHz; Ch 15: 89 GHz (f0 = 57290.344 MHz; df = 322.4 MHz)) |
| ChanHSB | 5 | Dimension of HSB Channel array (Channel 1: Deleted 89.0 GHz channel: always invalid; Ch 2: 150.0 GHz; Ch 3: f0 +/- 1.0 GHz; Ch 4: f0 +/- 3.0 GHz; Ch 5: f0 +/- 7.0 GHz (f0 = 183.31 GHz)) |
| MWHingeSurf | 7 | Number of standard frequency hinge points in Microwave surface emissivity and surface brightness. Frequencies are 23.8, 31.4, 50.3, 52.8, 89.0, 150.0, 183.3 GHz respectively. |
| XtraPressureLev | 100 | Number of pressure altitude layers in high vertical resolution support products (from top of the atmosphere down) |
| XtraPressureLay | 100 | Number of pressure altitude layers in high vertical resolution support products (Always equal to XtraPressureLev: first layer goes from the top of the atmosphere to level 1) |
| HingeCloud | 7 | Frequency hinge points in cloud emissivity in order of increasing frequency. Only first numHingeCloud elements are valid |
| HingeSurfInIt | 50 | Maximum number of frequency hinge points in IR surface emissivity from initial regression |
| VisXTrack | 8 | The number of Vis cross-track spots per AIRS. Direction is the same as GeoXTrack & AIRSXTrack -- starting at the left and increasing towards the right as you look along the satellite's path |
| VisTrack | 9 | The number of Vis along-track spots per AIRS. Direction is the same as GeoTrack & AIRSTrack -- parallel to the satellite's path, increasing with time. (opposite order to detector ordering -- detector 0 is last) |
| VChn | 4 | The number of Visible channels |
| ScoresBand | 10 | The number of IR frequency bands for which Initial_CC subscores are calculated. Band limits are (in cm^-1): 645., 704., 800., 1000., 1200., 2200., 2304., 2382., 2390., 2400., 2600. |
| CCTest | 10 | The number of cloud-clearing tests |
| VisGeoSpots | 4 | Geolocations for the 4 corner pixels in the order: trailing first scanned; trailing last-scanned; leading first-scanned; leading last-scanned. Each footprint also has a central geolocation associated with the swath geolocation lat/lon/time of the footprint. |

Geolocation Fields

These fields appear for every footprint (GeoTrack * GeoXTrack times) and correspond to footprint center coordinates and "shutter" time.

| Name | Explanation |
|-----------|--|
| Latitude | Footprint boresight geodetic Latitude in degrees North (-90.0 ... 90.0) |
| Longitude | Footprint boresight geodetic Longitude in degrees East (-180.0 ... 180.0) |
| Time | Footprint "shutter" TAI Time: floating-point elapsed seconds since Jan 1, 1993 |

Size: 32400 bytes (0.0 MB) per 45-scanset granule

Attributes

These fields appear only once per granule

| Name | Type | Extra Dimensions | Explanation |
|------------------|----------------------------|------------------|---|
| processing_level | string of 8-bit characters | None | Zero-terminated character string denoting processing level ("level2") |
| instrument | string of 8-bit characters | None | Zero-terminated character string denoting instrument ("AIRS") |
| DayNightFlag | string of 8-bit characters | None | Zero-terminated character string denoting granule as day and/or night: (Always "Day", "Night", or "Both") |
| AutomaticQAFlag | string of 8-bit characters | None | Zero-terminated character string denoting granule data quality: (Always "Passed", "Failed", or "Suspect") |
| NumTotalData | 32-bit integer | None | Total number of expected scene footprints |
| NumProcessData | 32-bit integer | None | Number of scene footprints which are present and can be processed routinely (state = 0) |
| NumSpecialData | 32-bit integer | None | Number of scene footprints which are present and can be processed only as a special test (state = 1) |
| NumBadData | 32-bit integer | None | Number of scene footprints which are present but cannot be processed (state = 2) |
| NumMissingData | 32-bit integer | None | Number of expected scene footprints which are not present (state = 3) |
| NumLandSurface | 32-bit integer | None | Number of scene footprints for which the surface is more than 90% land |
| NumOceanSurface | 32-bit integer | None | Number of scene footprints for which the surface is less than 10% land |
| node_type | string of 8-bit characters | None | Zero-terminated character string denoting whether granule is ascending, descending, or pole-crossing: ("Ascending" and "Descending" for entirely ascending or entirely descending granules, or "NorthPole" or "SouthPole" for pole-crossing granules) |
| start_year | 32-bit integer | None | Year in which granule started, UTC (e.g. 1999) |
| start_month | 32-bit integer | None | Month in which granule started, UTC (1 ... 12) |
| start_day | 32-bit integer | None | Day of month in which granule started, UTC (1 ... 31) |
| start_hour | 32-bit integer | None | Hour of day in which granule started, UTC (0 ... 23) |
| start_minute | 32-bit integer | None | Minute of hour in which granule started, UTC (0 ... 59) |
| start_sec | 32-bit floating-point | None | Second of minute in which granule started, UTC (0.0 ... 59.0) |
| start_orbit | 32-bit integer | None | Orbit number of mission in which granule started |
| end_orbit | 32-bit integer | None | Orbit number of mission in which granule ended |
| orbit_path | 32-bit integer | None | Orbit path of start orbit (1 ... 233 as defined by EOS project) |
| start_orbit_row | 32-bit integer | None | Orbit row at start of granule (1 ... 248 as defined by EOS project) |
| end_orbit_row | 32-bit integer | None | Orbit row at end of granule (1 ... 248 as defined by EOS project) |
| granule_number | 32-bit integer | None | Number of granule within day (1 ... 240) |
| num_scansets | 32-bit integer | None | Number of scansets in granule (1 ... 45) |
| num_scanlines | 32-bit integer | None | Number of scanlines in granule (1 * num_scansets) |
| start_Latitude | 64-bit floating-point | None | Geodetic Latitude of spacecraft at start of granule in degrees North (-90.0 ... 90.0) |
| start_Longitude | 64-bit floating-point | None | Geodetic Longitude of spacecraft at start of granule in degrees East (-180.0 ... 180.0) |
| start_Time | 64-bit floating-point | None | TAI Time at start of granule (floating-point elapsed seconds since start of 1993) |
| end_Latitude | 64-bit floating-point | None | Geodetic Latitude of spacecraft at end of granule in degrees North (-90.0 ... 90.0) |

| | | | |
|--------------------|-------------------------|-----------------------------|---|
| end_Longitude | 64-bit floating-point | None | Geodetic Longitude of spacecraft at end of granule in degrees East (-180.0 ... 180.0) |
| end_Time | 64-bit floating-point | None | TAI Time at end of granule (floating-point elapsed seconds since start of 1993) |
| eq_x_longitude | 32-bit floating-point | None | Longitude of spacecraft at southward equator crossing nearest granule start in degrees East (-180.0 ... 180.0) |
| eq_x_tai | 64-bit floating-point | None | Time of eq_x_longitude in TAI units (floating-point elapsed seconds since start of 1993) |
| orbitgeoqa | 32-bit unsigned integer | None | Orbit Geolocation QA: bit 0 (LSB): bad input value (last scanline); bit 1: bad input value (first scanline); bit 2: PGS_EPH_GetEphMet() returned PGSEPH_E_NO_SC_EPHEM_FILE; bit 3: PGS_EPH_GetEphMet() returned PGSEPH_E_BAD_ARRAY_SIZE; bit 4: PGS_EPH_GetEphMet() returned PGSTD_E_TIME_FMT_ERROR; bit 5: PGS_EPH_GetEphMet() returned PGSTD_E_TIME_VALUE_ERROR; bit 6: PGS_EPH_GetEphMet() returned PGSTD_E_SC_TAG_UNKNOWN; bit 7: PGS_EPH_GetEphMet() returned PGS_E_TOOLKIT; bit 8: PGS_TD_UTCtoTAI() returned PGSTD_E_NO_LEAP_SECS; bit 9: PGS_TD_UTCtoTAI() returned PGSTD_E_TIME_FMT_ERROR; bit 10: PGS_TD_UTCtoTAI() returned PGSTD_E_TIME_VALUE_ERROR; bit 11: PGS_TD_UTCtoTAI() returned PGS_E_TOOLKIT; bit 12: PGS_CSC_DayNight() returned PGSTD_E_NO_LEAP_SECS; bit 13: PGS_CSC_DayNight() returned PGSCSC_E_INVALID_LIMITTAG; bit 14: PGS_CSC_DayNight() returned PGSCSC_E_BAD_ARRAY_SIZE; bit 15: PGS_CSC_DayNight() returned PGSCSC_W_ERROR_IN_DAYNIGHT; bit 16: PGS_CSC_DayNight() returned PGSCSC_W_BAD_TRANSFORM_VALUE; bit 17: PGS_CSC_DayNight() returned PGSCSC_W_BELOW_HORIZON; bit 18: PGS_CSC_DayNight() returned PGSTD_E_NO_UT1_VALUE; bit 19: PGS_CSC_DayNight() returned PGSTD_E_BAD_INITIAL_TIME; bit 20: PGS_CSC_DayNight() returned PGSCBP_E_TIME_OUT_OF_RANGE; bit 21: PGS_CSC_DayNight() returned PGSCBP_E_UNABLE_TO_OPEN_FILE; bit 22: PGS_CSC_DayNight() returned PGSMEM_E_NO_MEMORY; bit 23: PGS_CSC_DayNight() returned PGS_E_TOOLKIT; bit 25-31: not used |
| num_satgeoqa | 16-bit integer | None | Number of scans with problems in satgeoqa |
| num_glintgeoqa | 16-bit integer | None | Number of scans with problems in glintgeoqa |
| num_moongeoqa | 16-bit integer | None | Number of scans with problems in moongeoqa |
| num_ftptgeoqa | 16-bit integer | None | Number of footprints with problems in ftptgeoqa |
| num_zengeoqa | 16-bit integer | None | Number of footprints with problems in zengeoqa |
| num_demgeoqa | 16-bit integer | None | Number of footprints with problems in demgeoqa |
| num_fpe | 16-bit integer | None | Number of floating point errors |
| LonGranuleCen | 16-bit integer | None | Geodetic Longitude of the center of the granule in degrees East (-180 ... 180) |
| LatGranuleCen | 16-bit integer | None | Geodetic Latitude of the center of the granule in degrees North (-90 ... 90) |
| LocTimeGranuleCen | 16-bit integer | None | Local solar time at the center of the granule in minutes past midnight (0 ... 1439) |
| pressSupp | 32-bit floating-point | XtraPressureLev (= 100) | Support pressures (lower boundary) in mb |
| numHingeSurfInit | 32-bit integer | None | Number of IR hinge points for surface emissivity and reflectivity from initial regression |
| freqEmisInit | 32-bit floating-point | HingeSurfInit (= 50) | Frequencies for surface emissivity and reflectivity in cm-1 (in order of increasing frequency. Only first numHingeSurfInit elements are valid) |
| rhoVisErr | 8-bit integer | VisTrack (= 9) * VChn (= 4) | Error estimate for rhoVis |
| num_invalid | 16-bit integer | None | # of footprints where invalid is True |
| num_clear_flag | 16-bit integer | None | # of footprints 100% clear |
| num_MW_ret_used | 16-bit integer | None | # of footprints where MW-only final retrieval used |
| num_retrieval_type | 16-bit integer | None | # of footprints without full retrieval |
| num_bad_l1b | 16-bit integer | None | # of footprints with Level 2 process not allowed due to bad level 1b data |
| num_bad_l1b_amsu | 16-bit integer | None | # of footprints with Bad AMSU-A level 1b data |
| num_bad_l1b_hsb | 16-bit integer | None | # of footprints with Bad HSB level 1b data |
| num_bad_l1b_airs | 16-bit integer | None | # of footprints with Bad AIRS level 1b data |
| num_bad_l1b_vis | 16-bit integer | None | # of footprints with Bad VIS level 1b data |
| num_forecast | 16-bit integer | None | # of footprints where Complete forecast guess was used |
| num_no_psurf_guess | 16-bit integer | None | # of footprints where No surface pressure was available. Topography was used for surf press |
| num_bad_temps | 16-bit integer | None | # of footprints with invalid temp and surface skin temp |

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|---------------------------|--|------|---|
| num_bad_h2o | 16-bit integer | None | # of footprints with invalid water vapor profile |
| num_bad_o3 | 16-bit integer | None | # of footprints with invalid ozone profile |
| num_bad_clouds | 16-bit integer | None | # of footprints with invalid cloud parameters |
| num_bad_low_atm | 16-bit integer | None | # of footprints with invalid result below 100 mb |
| num_no_tuning | 16-bit integer | None | # of footprints with Standard br temp tuning NOT applied |
| num_no_ang_corr | 16-bit integer | None | # of footprints with Standard angle correction NOT applied |
| num_no_mw | 16-bit integer | None | # of footprints with MW only retrieval not attempted |
| num_no_initial | 16-bit integer | None | # of footprints with First retrieval not attempted |
| num_no_final | 16-bit integer | None | # of footprints with Final retrieval not attempted |
| num_mw_fpe | 16-bit integer | None | # of footprints with floating-point exception in MW retrieval step |
| num_initial_fpe | 16-bit integer | None | # of footprints with floating-point exception in Initial retrieval step |
| num_final_fpe | 16-bit integer | None | # of footprints with floating-point exception in Final retrieval step |
| num_MWPrecip | 16-bit integer | None | # of footprints where Precipitation was detected over 0.5 mm/hr |
| num_precipAA4_50km | 16-bit integer | None | # of footprints with nonzero precipitation correction in AMSU-A channel 4 |
| num_precipAA5_50km | 16-bit integer | None | # of footprints with nonzero precipitation correction in AMSU-A channel 5 |
| num_precipAA6_50km | 16-bit integer | None | # of footprints with nonzero precipitation correction in AMSU-A channel 6 |
| num_precipAA7_50km | 16-bit integer | None | # of footprints with nonzero precipitation correction in AMSU-A channel 7 |
| num_precipAA8_50km | 16-bit integer | None | # of footprints with nonzero precipitation correction in AMSU-A channel 8 |
| num_precipAA9_50km | 16-bit integer | None | # of footprints with nonzero precipitation correction in AMSU-A channel 9 |
| stat_aa4_precip_corr_50km | Unlimited Engineering Struct (see below) | None | Statistics of precipitation correction for AMSU-A channel 4 (Kelvins) |
| stat_aa5_precip_corr_50km | Unlimited Engineering Struct (see below) | None | Statistics of precipitation correction for AMSU-A channel 5 (Kelvins) |
| stat_aa6_precip_corr_50km | Unlimited Engineering Struct (see below) | None | Statistics of precipitation correction for AMSU-A channel 6 (Kelvins) |
| stat_aa7_precip_corr_50km | Unlimited Engineering Struct (see below) | None | Statistics of precipitation correction for AMSU-A channel 7 (Kelvins) |
| stat_aa8_precip_corr_50km | Unlimited Engineering Struct (see below) | None | Statistics of precipitation correction for AMSU-A channel 8 (Kelvins) |
| stat_aa9_precip_corr_50km | Unlimited Engineering Struct (see below) | None | Statistics of precipitation correction for AMSU-A channel 9 (Kelvins) |
| stat_rain_rate_50km | Unlimited Engineering Struct (see below) | None | Statistics of rain rate (mm/hr) |
| stat_MWsurf_R0 | Unlimited Engineering Struct (see below) | None | Statistics of internal adjustment parameter -- surface R0 |
| stat_MWsurf_T0 | Unlimited Engineering Struct (see below) | None | Statistics of internal adjustment parameter -- surface T0 |
| stat_MWsurf_Tinf | Unlimited Engineering Struct (see below) | None | Statistics of internal adjustment parameter -- surface Tinfinity |
| stat_MWseice_conc | Unlimited Engineering Struct (see below) | None | Statistics of ice or snow concentration (0-1) |
| stat_MWresidual_temp | Limited Engineering | None | Statistics of sum of squares of temperature residuals normalized by channel sensitivities |

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| | Struct (see below) | | |
| stat_MWresidual_mois | Limited Engineering Struct (see below) | None | Statistics of sum of squares of moisture residuals normalized by channel sensitivities |
| stat_MWresidual_AMSUA | Unlimited Engineering Struct (see below) | ChanAMSUA (= 15) | Statistics of Brightness temperature residual for each AMSU-A channel (Kelvin) |
| stat_MWresidual_HSB | Unlimited Engineering Struct (see below) | ChanHSB (= 5) | Statistics of brightness temperature residual for each HSB channel (Kelvin) |
| stat_MWiter_temp | Unlimited Engineering Struct (see below) | None | Statistics of # of iterations of the temperature profile |
| stat_MWiter_mois | Unlimited Engineering Struct (see below) | None | Statistics of # of iterations of the moisture profile |
| num_mw_ret_code | 16-bit integer | None | Return code status of MW retrieval not zero |
| num_cloud_ice | 16-bit integer | None | # of footprints with Scattering by cloud ice present in FOV |
| num_icc_too_cloudy | 16-bit integer | None | # of footprints with Initial cloud clearing pass too cloudy |
| num_icc_low_contrast | 16-bit integer | None | # of footprints with Initial cloud clearing pass contrast too low |
| num_icc_bad_rad | 16-bit integer | None | # of footprints with Initial cloud clearing pass cloud cleared radiances do not match clear guess - reject the IR retrieval |
| stat_icc_percent_cld | Unlimited Engineering Struct (see below) | None | Statistics of Initial cloud clearing cloudy percent |
| stat_icc_contrast | Unlimited Engineering Struct (see below) | None | Statistics of Initial cloud clearing contrast (units?) |
| num_bad_1st | 16-bit integer | None | # of footprints where The initial retrieval failed |
| num_bad_1st_cc | 16-bit integer | None | # of footprints where The first cloud clearing failed |
| num_bad_1st_regres | 16-bit integer | None | # of footprints where The regression guess failed |
| num_bad_1st_phys | 16-bit integer | None | # of footprints where The first physical retrieval failed |
| num_fcc_too_cloudy | 16-bit integer | None | # of footprints where Final cloud clearing pass too cloudy |
| num_fcc_low_contrast | 16-bit integer | None | # of footprints where Final cloud clearing pass contrast too low |
| num_fcc_bad_rad | 16-bit integer | None | # of footprints where Final cloud clearing pass cloud cleared radiances do not match clear guess - reject the IR retrieval |
| stat_fcc_percent_cld1 | Unlimited Engineering Struct (see below) | None | Statistics of Final cloud clearing cloudy percent pass 1 |
| stat_fcc_percent_cld2 | Unlimited Engineering Struct (see below) | None | Statistics of Final cloud clearing cloudy percent pass 2 |
| stat_fcc_contrast1 | Unlimited Engineering Struct (see below) | None | Statistics of Final cloud clearing contrast (units?) pass 1 |
| stat_fcc_contrast2 | Unlimited Engineering Struct (see below) | None | Statistics of Final cloud clearing contrast (units?) pass 2 |
| num_bad_final | 16-bit integer | None | # of footprints where Final retrieval failed |
| num_bad_final_cc | 16-bit integer | None | # of footprints where final cloud clearing failed |
| num_bad_final_ir | 16-bit integer | None | # of footprints where final IR retrieval failed |
| num_bad_final_surf | 16-bit integer | None | # of footprints where final surface ret failed |
| num_bad_final_temp | 16-bit integer | None | # of footprints where final temp ret failed |
| num_bad_final_h2o | 16-bit integer | None | # of footprints where final water vapor ret failed |

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|---------------------------|--|-------------------|---|
| num_bad_final_o3 | 16-bit integer | None | # of footprints where final ozone ret failed |
| num_bad_final_cloud | 16-bit integer | None | # of footprints where final cloud ret failed |
| num_bad_cc_cld_ret | 16-bit integer | None | # of footprints where Cloud clearing and cloud ret are inconsistent |
| num_MW_IR_ret_differ | 16-bit integer | None | # of footprints where Microwave and IR temperature retrieval differ too much - reject final IR retrieval |
| num_bad_MW_low_resid | 16-bit integer | None | # of footprints with Microwave residuals in lower atmosphere too large - reject final IR retrieval |
| stat_MW_low_atm_resid | Unlimited Engineering Struct (see below) | None | Statistics of MW residual for lower atmosphere after final retrieval |
| num_final_AMSU_ret | 16-bit integer | None | # of footprints with nonzero final_AMSU_ret |
| num_final_HSB_ret | 16-bit integer | None | # of footprints with nonzero final_HSB_ret |
| num_final_cloud_ret | 16-bit integer | None | # of footprints with nonzero final_cloud_ret |
| num_final_surf_ret | 16-bit integer | None | # of footprints with nonzero final_surf_ret |
| num_final_temp_ret | 16-bit integer | None | # of footprints with nonzero final_temp_ret |
| num_final_h2o_ret | 16-bit integer | None | # of footprints with nonzero final_h2o_ret |
| num_final_o3_ret | 16-bit integer | None | # of footprints with nonzero final_o3_ret |
| num_final_ch4_ret | 16-bit integer | None | # of footprints with nonzero final_ch4_ret |
| num_final_co_ret | 16-bit integer | None | # of footprints with nonzero final_co_ret |
| num_final_co2_ret | 16-bit integer | None | # of footprints with nonzero final_co2_ret |
| num_low_sun | 16-bit integer | None | # of footprints with solar zenith angle > 60 degrees |
| num_wide_ang | 16-bit integer | None | # of footprints with viewing angle at center of AIRS spot > 50 degrees |
| num_vis_glnt | 16-bit integer | None | # of footprints with sun-glnt is expected to alter radiances for any water surfaces in the AMSU FOV by at least 5%. (No test is made, however, for whether any water is actually located within the FOV.) |
| num_bad_vis_rad | 16-bit integer | None | # of footprints with Vis/NIR radiance out of range |
| num_bad_vis_cal | 16-bit integer | None | # of footprints with Vis/NIR calibration data old or invalid |
| num_bad_vis_det_temp | 16-bit integer | None | # of footprints with Vis/NIR Detector temperature out of range |
| num_bad_scan_hd_temp | 16-bit integer | None | # of footprints with Scan Head Assembly temperature out of range |
| num_bad_vis_cld_det | 16-bit integer | None | # of footprints with Cloud detection failed |
| num_bad_vis_cld_hgt | 16-bit integer | None | # of footprints with Cloud height failed |
| num_bad_ref_NDVI | 16-bit integer | None | # of footprints with Bad reference Normalized Differential Vegetation Index |
| num_bad_vis_var | 16-bit integer | None | # of footprints with Variability index invalid |
| num_vis_clear | 16-bit integer | None | # of footprints where at least 97.2% of each IR FOV within the AMSU FOV is clear sky |
| num_vis_cloudy | 16-bit integer | None | # of footprints with at least 79.2% of each IR FOV within the AMSU FOV is cloudy |
| num_vis_low_cloud | 16-bit integer | None | # of footprints with at least 79.2% of each IR FOV within the AMSU FOV is low_cloud |
| stat_Initial_CC_score | Unlimited Engineering Struct (see below) | None | Statistics of Indicator of how well the initial cloud-cleared radiances match radiances reconstructed from clear eigenvectors. (0.0 for a perfect match; 10.0 indicates a major problem) |
| stat_Initial_CC_subscores | Unlimited Engineering Struct (see below) | ScoresBand (= 10) | Statistics of Sub-scores contributing to Initial_CC_score, by frequency band |
| NumVisInvalid | 32-bit integer | None | Number of profiles in which L2 Vis processing encountered a problem |
| NumMWStratIrRetOnly | 32-bit integer | None | Number of profiles in which the final product comes only from MW and stratospheric IR information (retrieval_types 20, 30, 40) |
| NumNoHSB | 32-bit integer | None | Number of retrieval profiles for which no HSB input data is used |
| NumNoAMSUA | 32-bit integer | None | Number of retrieval profiles for which no AMSU-A input data is used |
| NumNoAIRS | 32-bit integer | None | Number of retrieval profiles for which no AIRS-IR input data is used |
| NumNoVis | 32-bit integer | None | Number of retrieval profiles for which no AIRS-V/NIR input data is used |
| DCRCount | 32-bit integer | None | Number of times a Direct Current Restore was executed for any module |
| PopCount | 32-bit integer | None | Number of popcorn events within granule, i.e. number of times than an AIRS channel used in the Level 2 retrieval has suffered a sudden discontinuity in |

| | | | |
|-------------------|----------------------------|------|---|
| | | | dark current |
| MoonInViewMWCount | 32-bit integer | None | Number of scanlines in granule with the moon in a Microwave space view (approx) |
| VegMapFileName | string of 8-bit characters | None | Name of input file used as Vegetation Map |

Size: 4022 bytes (0.0 MB) per granule

Along-Track Data Fields

These fields appear once per scanline (GeoTrack times)

| Name | Type | Extra Dimensions | Explanation |
|------------|-------------------------|------------------|--|
| satheight | 32-bit floating-point | None | Satellite altitude at nadirTAI in km above reference ellipsoid (e.g. 725.2) |
| satroll | 32-bit floating-point | None | Satellite attitude roll angle at nadirTAI (-180.0 ... 180.0 angle about the +x (roll) ORB axis, +x axis is positively oriented in the direction of orbital flight completing an orthogonal triad with y and z.) |
| satpitch | 32-bit floating-point | None | Satellite attitude pitch angle at nadirTAI (-180.0 ... 180.0 angle about +y (pitch) ORB axis, +y axis is oriented normal to the orbit plane with the positive sense opposite to that of the orbit's angular momentum vector H.) |
| satyaw | 32-bit floating-point | None | Satellite attitude yaw angle at nadirTAI (-180.0 ... 180.0 angle about +z (yaw) axis, +z axis is positively oriented earthward parallel to the satellite radius vector R from the spacecraft center of mass to the center of the Earth.) |
| satgeoqa | 32-bit unsigned integer | None | Satellite Geolocation QA flags: bit 0 (LSB): bad input value; bit 1: PGS_TD_TAItUTC() returned PGSTD_E_NO_LEAP_SECS; bit 2: PGS_TD_TAItUTC() returned PGS_E_TOOLKIT; bit 3: PGS_EPH_EphemAttit() returned PGSEPH_E_BAD_EPHEM_VALUE; bit 4: PGS_EPH_EphemAttit() returned PGSEPH_E_BAD_EPHEM_FILE_HDR; bit 5: PGS_EPH_EphemAttit() returned PGSEPH_E_NO_SC_EPHEM_FILE; bit 6: PGS_EPH_EphemAttit() returned PGSEPH_E_NO_DATA_REQUESTED; bit 7: PGS_EPH_EphemAttit() returned PGSTD_E_SC_TAG_UNKNOWN; bit 8: PGS_EPH_EphemAttit() returned PGSEPH_E_BAD_ARRAY_SIZE; bit 9: PGS_EPH_EphemAttit() returned PGSTD_E_TIME_FMT_ERROR; bit 10: PGS_EPH_EphemAttit() returned PGSTD_E_TIME_VALUE_ERROR; bit 11: PGS_EPH_EphemAttit() returned PGSTD_E_NO_LEAP_SECS; bit 12: PGS_EPH_EphemAttit() returned PGS_E_TOOLKIT; bit 13: PGS_CSC_ECItECR() returned PGSCSC_W_BAD_TRANSFORM_VALUE; bit 14: PGS_CSC_ECItECR() returned PGSCSC_E_BAD_ARRAY_SIZE; bit 15: PGS_CSC_ECItECR() returned PGSTD_E_NO_LEAP_SECS; bit 16: PGS_CSC_ECItECR() returned PGSTD_E_TIME_FMT_ERROR; bit 17: PGS_CSC_ECItECR() returned PGSTD_E_TIME_VALUE_ERROR; bit 18: unused (set to zero); bit 19: PGS_CSC_ECItECR() returned PGSTD_E_NO_UT1_VALUE; bit 20: PGS_CSC_ECItECR() returned PGS_E_TOOLKIT; bit 21: PGS_CSC_ECRtoGEO() returned PGSCSC_W_TOO_MANY_ITERS; bit 22: PGS_CSC_ECRtoGEO() returned PGSCSC_W_INVALID_ALTITUDE; bit 23: PGS_CSC_ECRtoGEO() returned PGSCSC_W_SPHERE_BODY; bit 24: PGS_CSC_ECRtoGEO() returned PGSCSC_W_LARGE_FLATTENING; bit 25: PGS_CSC_ECRtoGEO() returned PGSCSC_W_DEFAULT_EARTH_MODEL; bit 26: PGS_CSC_ECRtoGEO() returned PGSCSC_E_BAD_EARTH_MODEL; bit 27: PGS_CSC_ECRtoGEO() returned PGS_E_TOOLKIT; bit 28-31: not used |
| glintgeoqa | 16-bit unsigned integer | None | Glint Geolocation QA flags: bit 0 (LSB): bad input value; bit 1: glint location in Earth's shadow; bit 2: glint calculation not converging; bit 3: glint location sun vs. satellite zenith mismatch; bit 4: glint location sun vs. satellite azimuth mismatch; bit 5: bad glint location; bit 6: PGS_CSC_ZenithAzimuth() returned any 'W' class return code; bit 7: PGS_CSC_ZenithAzimuth() returned any 'E' class return code; bit 8: PGS_CBP_Earth_CB_Vector() returned returned any 'W' class return code; bit 9: PGS_CBP_Earth_CB_Vector() returned returned any 'E' class return code; bit 10: PGS_CSC_ECItECR() returned any 'W' class return code except PGSCSC_W_PREDICTED_UT1 (for Glint); bit 11: PGS_CSC_ECItECR() returned any 'E' class return code (for Glint); bit 12: PGS_CSC_ECRtoGEO() returned any 'W' class return code (for Glint); bit 13: PGS_CSC_ECRtoGEO() returned any 'E' class return code (for Glint); bit 14: PGS_CSC_ECItECR() returned any 'W' class return code except PGSCSC_W_PREDICTED_UT1; bit 15: PGS_CSC_ECItECR() returned any 'E' class return code |
| moongeoqa | 16-bit unsigned integer | None | Moon Geolocation QA flags: bit 0 (LSB): bad input value; bit 1: PGS_TD_TAItUTC() returned PGSTD_E_NO_LEAP_SECS; bit 2: PGS_TD_TAItUTC() returned PGS_E_TOOLKIT; bit 3: PGS_CBP_Sat_CB_Vector() returned PGSCSC_W_BELOW_SURFACE; bit 4: PGS_CBP_Sat_CB_Vector() returned PGSCBP_W_BAD_CB_VECTOR; bit 5: PGS_CBP_Sat_CB_Vector() returned PGSCBP_E_BAD_ARRAY_SIZE; bit 6: PGS_CBP_Sat_CB_Vector() returned PGSCBP_E_INVALID_CB_ID; bit 7: PGS_CBP_Sat_CB_Vector() returned PGSMEM_E_NO_MEMORY; bit 8: PGS_CBP_Sat_CB_Vector() returned PGSCBP_E_UNABLE_TO_OPEN_FILE; bit 9: PGS_CBP_Sat_CB_Vector() returned PGSTD_E_BAD_INITIAL_TIME; bit 10: PGS_CBP_Sat_CB_Vector() returned PGSCBP_E_TIME_OUT_OF_RANGE; bit 11: PGS_CBP_Sat_CB_Vector() returned PGSTD_E_SC_TAG_UNKNOWN; bit 12: PGS_CBP_Sat_CB_Vector() returned PGSEPH_E_BAD_EPHEM_FILE_HDR; bit 13: PGS_CBP_Sat_CB_Vector() returned PGSEPH_E_NO_SC_EPHEM_FILE; bit 14: PGS_CBP_Sat_CB_Vector() returned PGS_E_TOOLKIT; bit 15: not used |
| nadirTAI | 64-bit floating-point | None | TAI time at which instrument is nominally looking directly down. (between footprints 15 & 16 for AMSU or between footprints 45 & 46 for AIRS/Vis & HSB) (floating-point elapsed seconds since start of 1993) |
| sat_lat | 64-bit floatinn- | None | Satellite geodetic latitude in degrees North (-90.0 ... 90.0) |

| | | | |
|----------------|-----------------------|------|---|
| | point | | |
| sat_lon | 64-bit floating-point | None | Satellite geodetic longitude in degrees East (-180.0 ... 180.0) |
| scan_node_type | 8-bit integer | None | 'A' for ascending, 'D' for descending, 'N' for North-Polar, 'S' for South-Polar |
| glintlat | 32-bit floating-point | None | Solar glint geodetic latitude in degrees North at nadirTAI (-90.0 ... 90.0) |
| glintlon | 32-bit floating-point | None | Solar glint geodetic longitude in degrees East at nadirTAI (-180.0 ... 180.0) |

Size: 2565 bytes (0.0 MB) per 45-scanset granule

Full Swath Data Fields

These fields appear for every footprint of every scanline in the granule (GeoTrack * GeoXTrack times)

| Name | Type | Extra Dimensions | Explanation |
|-----------|-------------------------|------------------|---|
| RetQAFlag | 16-bit unsigned integer | None | Retrieval QA flags: users are advised not to use unless all bits are zero. bits 10-15: spare, set to zero.; bit 9 (value 512): retrieved ocean SST disagrees with NCEP forecast by at least 3 K; bit 8 (value 256): This record type not yet validated; bits 5-7: spare, set to zero; bit 4 (value 16): Final retrieval rejected or not attempted; bit 3 (value 8): Final Cloud Clearing rejected or not attempted; bit 2 (value 4): Regression First Guess rejected or not attempted; bit 1 (value 2): Initial Cloud Clearing rejected or not attempted; bit 0 (LSB, value 1): MW retrieval rejected or not attempted |
| ftptgeoqa | 32-bit unsigned integer | None | Footprint Geolocation QA flags: bit 0 (LSB): bad input value; bit 1: PGS_TD_TAltoUTC() returned PGSTD_E_NO_LEAP_SECS; bit 2: PGS_TD_TAltoUTC() returned PGS_E_TOOLKIT; bit 3: PGS_CSC_GetFOV_Pixel() returned PGSCSC_W_MISS_EARTH; bit 4: PGS_CSC_GetFOV_Pixel() returned PGSTD_E_SC_TAG_UNKNOWN; bit 5: PGS_CSC_GetFOV_Pixel() returned PGSCSC_W_ZERO_PIXEL_VECTOR; bit 6: PGS_CSC_GetFOV_Pixel() returned PGSCSC_W_BAD_EPH_FOR_PIXEL; bit 7: PGS_CSC_GetFOV_Pixel() returned PGSCSC_W_INSTRUMENT_OFF_BOARD; bit 8: PGS_CSC_GetFOV_Pixel() returned PGSCSC_W_BAD_ACCURACY_FLAG; bit 9: PGS_CSC_GetFOV_Pixel() returned PGSCSC_E_BAD_ARRAY_SIZE; bit 10: PGS_CSC_GetFOV_Pixel() returned PGSCSC_W_DEFAULT_EARTH_MODEL; bit 11: PGS_CSC_GetFOV_Pixel() returned PGSCSC_W_DATA_FILE_MISSING; bit 12: PGS_CSC_GetFOV_Pixel() returned PGSCSC_E_NEG_OR_ZERO_RAD; bit 13: PGS_CSC_GetFOV_Pixel() returned PGSMEM_E_NO_MEMORY; bit 14: PGS_CSC_GetFOV_Pixel() returned PGSTD_E_NO_LEAP_SECS; bit 15: PGS_CSC_GetFOV_Pixel() returned PGSTD_E_TIME_FMT_ERROR; bit 16: PGS_CSC_GetFOV_Pixel() returned PGSTD_E_TIME_VALUE_ERROR; bit 17: PGS_CSC_GetFOV_Pixel() returned PGSCSC_W_PREDICTED_UT1; bit 18: PGS_CSC_GetFOV_Pixel() returned PGSTD_E_NO_UT1_VALUE; bit 19: PGS_CSC_GetFOV_Pixel() returned PGS_E_TOOLKIT; bit 20: PGS_CSC_GetFOV_Pixel() returned PGSEPH_E_BAD_EPHEM_FILE_HDR; bit 21: PGS_CSC_GetFOV_Pixel() returned PGSEPH_E_NO_SC_EPHEM_FILE; bit 22-31: not used |
| zengeoqa | 16-bit unsigned integer | None | Satellite zenith Geolocation QA flags: bit 0 (LSB): (Spacecraft) bad input value; bit 1: PGS_CSC_ZenithAzimuth(S/C) returned PGSCSC_W_BELOW_HORIZON; bit 2: PGS_CSC_ZenithAzimuth(S/C) returned PGSCSC_W_UNDEFINED_AZIMUTH; bit 3: PGS_CSC_ZenithAzimuth(S/C) returned PGSCSC_W_NO_REFRACTION; bit 4: PGS_CSC_ZenithAzimuth(S/C) returned PGSCSC_E_INVALID_VECTAG; bit 5: PGS_CSC_ZenithAzimuth(S/C) returned PGSCSC_E_LOOK_PT_ALTIT_RANGE; bit 6: PGS_CSC_ZenithAzimuth(S/C) returned PGSCSC_E_ZERO_INPUT_VECTOR; bit 7: PGS_CSC_ZenithAzimuth(S/C) returned PGS_E_TOOLKIT; bit 8: (Sun) bad input value; bit 9: (suppressed) PGS_CSC_ZenithAzimuth(Sun) returned PGSCSC_W_BELOW_HORIZON (This is not an error condition - the sun is below the horizon at night); bit 10: PGS_CSC_ZenithAzimuth(Sun) returned PGSCSC_W_UNDEFINED_AZIMUTH; bit 11: PGS_CSC_ZenithAzimuth(Sun) returned PGSCSC_W_NO_REFRACTION; bit 12: PGS_CSC_ZenithAzimuth(Sun) returned PGSCSC_E_INVALID_VECTAG; bit 13: PGS_CSC_ZenithAzimuth(Sun) returned PGSCSC_E_LOOK_PT_ALTIT_RANGE; bit 14: PGS_CSC_ZenithAzimuth(Sun) returned PGSCSC_E_ZERO_INPUT_VECTOR; bit 15: PGS_CSC_ZenithAzimuth(Sun) returned PGS_E_TOOLKIT |
| demgeoqa | 16-bit unsigned integer | None | Digital Elevation Model (DEM) Geolocation QA flags: bit 0 (LSB): bad input value; bit 1: Could not allocate memory; bit 2: Too close to North or South pole. Excluded; bit 3: Layer resolution incompatibility. Excluded; bit 4: Any DEM Routine (elev) returned PGSDM_E_IMPROPER_TAG; bit 5: Any DEM Routine (elev) returned PGSDM_E_CANNOT_ACCESS_DATA; bit 6: Any DEM Routine (land/water) returned PGSDM_E_IMPROPER_TAG; bit 7: Any DEM Routine (land/water) returned PGSDM_F_CANNOT_ACCESS_DATA; bit |

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| | | | 8: Reserved for future layers; bit 9: Reserved for future layers; bit 10: PGS_DEM_GetRegion(elev) returned PGSDEM_M_FILLVALUE_INCLUDED; bit 11: PGS_DEM_GetRegion(land/water) returned PGSDEM_M_FILLVALUE_INCLUDED; bit 12: Reserved for future layers; bit 13: PGS_DEM_GetRegion(all) returned PGSDEM_M_MULTIPLE_RESOLUTIONS; bit 14: PGS_CSC_GetFOV_Pixel() returned any 'W' class return code except PGSCSC_W_PREDICTED_UT1; bit 15: PGS_CSC_GetFOV_Pixel() returned any 'E' class return code |
| satzen | 32-bit floating-point | None | Spacecraft zenith angle (0.0 ... 180.0) degrees from zenith (measured relative to the geodetic vertical on the reference (WGS84) spheroid and including corrections outlined in EOS SDP toolkit for normal accuracy.) |
| satazi | 32-bit floating-point | None | Spacecraft azimuth angle (-180.0 ... 180.0) degrees E of N GEO) |
| solzen | 32-bit floating-point | None | Solar zenith angle (0.0 ... 180.0) degrees from zenith (measured relative to the geodetic vertical on the reference (WGS84) spheroid and including corrections outlined in EOS SDP toolkit for normal accuracy.) |
| solazi | 32-bit floating-point | None | Solar azimuth angle (-180.0 ... 180.0) degrees E of N GEO) |
| sun_glint_distance | 16-bit integer | None | Distance (km) from footprint center to location of the sun glint (-9999 for unknown, 30000 for no glint visible because spacecraft is in Earth's shadow) |
| topog | 32-bit floating-point | None | Mean topography in meters above reference ellipsoid |
| topog_err | 32-bit floating-point | None | Error estimate for topog |
| landFrac | 32-bit floating-point | None | Fraction of spot that is land (0.0 ... 1.0) |
| landFrac_err | 32-bit floating-point | None | Error estimate for landFrac |
| satzen_amsu | 32-bit floating-point | None | Satellite zenith angle (0.0 ... 180.0) degrees from zenith (measured relative to the geodetic vertical on the reference (WGS84) spheroid and including corrections outlined in EOS SDP toolkit for normal accuracy.) (AMSU-A FOV center) |
| satazi_amsu | 32-bit floating-point | None | Spacecraft azimuth angle (-180.0 ... 180.0) degrees E of N GEO (AMSU-A FOV center) |
| satzen_hsb | 32-bit floating-point | None | Satellite zenith angle (0.0 ... 180.0) degrees from zenith (measured relative to the geodetic vertical on the reference (WGS84) spheroid and including corrections outlined in EOS SDP toolkit for normal accuracy.) (HSB center FOV) |
| satazi_hsb | 32-bit floating-point | None | Spacecraft azimuth angle (-180.0 ... 180.0) degrees E of N GEO (HSB center FOV) |
| latAIRS | 32-bit floating-point | AIRSTrack (= 3) * AIRSXTrack (= 3) | Geodetic center latitude of AIRS spots in degrees North (-90.0 ... 90.0) |
| lonAIRS | 32-bit floating-point | AIRSTTrack (= 3) * AIRSXTrack (= 3) | Geodetic center longitude of AIRS spots in degrees East (-180.0 ... 180.0) |
| PrecipAA4_50km | 8-bit unsigned integer | None | Relative interference (0-2) of precipitation on AMSU-A channel 4 (-1/255 for unknown) |
| PrecipAA5_50km | 8-bit unsigned integer | None | Relative interference (0-2) of precipitation on AMSU-A channel 5 (-1/255 for unknown) |
| PrecipAA6_50km | 8-bit unsigned integer | None | Relative interference (0-2) of precipitation on AMSU-A channel 6 (-1/255 for unknown) |
| PrecipAA7_50km | 8-bit unsigned integer | None | Relative interference (0-2, 3=indeterminate) of precipitation on AMSU-A channel 7 (-1/255 for unknown) |
| PrecipAA8_50km | 8-bit unsigned integer | None | Relative interference (0-2) of precipitation on AMSU-A channel 8 (-1/255 for unknown) |
| PrecipAA9_50km | 8-bit unsigned integer | None | Relative interference (0-2) of precipitation on AMSU-A channel 9 (-1/255 for unknown) |
| PrecipAA4_15km | 8-bit unsigned integer | AIRSTTrack (= 3) * AIRSXTrack (= 3) | Relative interference (0-2) of precipitation on AMSU-A channel 4 for HSB 15-km spots (-1/255 for unknown) |
| PrecipAA5_15km | 8-bit unsigned integer | AIRSTTrack (= 3) * AIRSXTrack (= 3) | Relative interference (0-2) of precipitation on AMSU-A channel 5 for HSB 15-km spots (-1/255 for unknown) |

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| PrecipAA6_15km | 8-bit unsigned integer | AIRSTrack (= 3) * AIRSXTrack (= 3) | Relative interference (0-2) of precipitation on AMSU-A channel 6 for HSB 15-km spots (-1/255 for unknown) |
| PrecipAA7_15km | 8-bit unsigned integer | AIRSTrack (= 3) * AIRSXTrack (= 3) | Relative interference (0-2, 3=indeterminate) of precipitation on AMSU-A channel 7 for HSB 15-km spots (-1/255 for unknown) |
| PrecipAA8_15km | 8-bit unsigned integer | AIRSTrack (= 3) * AIRSXTrack (= 3) | Relative interference (0-2) of precipitation on AMSU-A channel 8 for HSB 15-km spots (-1/255 for unknown) |
| PrecipAA9_15km | 8-bit unsigned integer | AIRSTrack (= 3) * AIRSXTrack (= 3) | Relative interference (0-2) of precipitation on AMSU-A channel 9 for HSB 15-km spots (-1/255 for unknown) |
| AMSU_A_4_Precip_Corr_50km | 32-bit floating-point | None | Correction to AMSU-A channel 4 for precipitation effects (Kelvins) |
| AMSU_A_5_Precip_Corr_50km | 32-bit floating-point | None | Correction to AMSU-A channel 5 for precipitation effects (Kelvins) |
| AMSU_A_6_Precip_Corr_50km | 32-bit floating-point | None | Correction to AMSU-A channel 6 for precipitation effects (Kelvins) |
| AMSU_A_7_Precip_Corr_50km | 32-bit floating-point | None | Correction to AMSU-A channel 7 for precipitation effects (Kelvins) |
| AMSU_A_8_Precip_Corr_50km | 32-bit floating-point | None | Correction to AMSU-A channel 8 for precipitation effects (Kelvins) |
| AMSU_A_9_Precip_Corr_50km | 32-bit floating-point | None | Correction to AMSU-A channel 9 for precipitation effects (Kelvins) |
| AMSU_A_4_Precip_Corr_15km | 32-bit floating-point | AIRSTrack (= 3) * AIRSXTrack (= 3) | Correction to AMSU-A channel 4 for precipitation effects for HSB 15-km spots (Kelvins) |
| AMSU_A_5_Precip_Corr_15km | 32-bit floating-point | AIRSTrack (= 3) * AIRSXTrack (= 3) | Correction to AMSU-A channel 5 for precipitation effects for HSB 15-km spots (Kelvins) |
| AMSU_A_6_Precip_Corr_15km | 32-bit floating-point | AIRSTrack (= 3) * AIRSXTrack (= 3) | Correction to AMSU-A channel 6 for precipitation effects for HSB 15-km spots (Kelvins) |
| AMSU_A_7_Precip_Corr_15km | 32-bit floating-point | AIRSTrack (= 3) * AIRSXTrack (= 3) | Correction to AMSU-A channel 7 for precipitation effects for HSB 15-km spots (Kelvins) |
| AMSU_A_8_Precip_Corr_15km | 32-bit floating-point | AIRSTrack (= 3) * AIRSXTrack (= 3) | Correction to AMSU-A channel 8 for precipitation effects for HSB 15-km spots (Kelvins) |
| AMSU_A_9_Precip_Corr_15km | 32-bit floating-point | AIRSTrack (= 3) * AIRSXTrack (= 3) | Correction to AMSU-A channel 9 for precipitation effects for HSB 15-km spots (Kelvins) |
| rain_rate_50km | 32-bit floating-point | None | Rain rate (mm/hr) |
| rain_rate_15km | 32-bit floating-point | AIRSTrack (= 3) * AIRSXTrack (= 3) | Rain rate for HSB 15-km spots (mm/hr) |
| MWSurfClass | 8-bit integer | None | Surface class from MW: 0 for coastline; 1 for land; 2 for ocean; 3 for first-year sea-ice; 4 for multi-year sea-ice; 5 for snow; 6 for glacier; -1/255 for unknown; more TBD |
| PSurfStd | 32-bit floating-point | None | Surface pressure first guess in mb, interpolated from forecast |
| nSurfSup | 32-bit integer | None | Index of first pressure level above mean surface (90 ... 100) |
| TSurfStd | 32-bit floating-point | None | Surface skin temperature in Kelvins |
| TSurfAir | 32-bit floating-point | None | Surface air temperature in Kelvins |
| TAirSup | 32-bit floating-point | XtraPressureLev (= 100) | Atmospheric Temperature at XtraPressLev in Kelvins |
| H2OCDSup | 32-bit floating-point | XtraPressureLay (= 100) | Layer column water vapor (molecules / cm**2) |
| lwCDSup | 32-bit floating-point | XtraPressureLay (= 100) | Layer molecular column density (molecules / cm**2) of cloud liquid water |
| lwCDSupErr | 32-bit floating-point | XtraPressureLay (= 100) | Error estimate for lwCDSup |
| clWSup | 32-bit integer | XtraPressureLay (= 100) | Cloud Ice/Water flag (liquid = 0 / Ice = 1) |
| O3CDSup | 32-bit floating-point | XtraPressureLay (= 100) | Layer column ozone in molecules per cm**2 |
| O3CDInit | 32-bit floating-point | XtraPressureLay (= 100) | preliminary Layer column ozone in molecules per cm**2 from initial regression step |
| COCDSup | 32-bit | XtraPressureLay (= 100) | Layer column carbon monoxide in molecules per cm**2 |

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| | floating-point | 100) | |
| CO2ppmv | 32-bit floating-point | None | Column averaged dry carbon dioxide volumetric mixing ratio (ppmv) |
| CH4CDSup | 32-bit floating-point | XtraPressureLay (= 100) | Layer column methane (in molecules per cm**2) |
| COCDSupErr | 32-bit floating-point | XtraPressureLay (= 100) | Error estimate for COCDSup |
| CO2ppmvErr | 32-bit floating-point | None | Error estimate for co2qppmv |
| CH4CDSupErr | 32-bit floating-point | XtraPressureLay (= 100) | Error estimate for CH4CDSup |
| numHingeCloud | 16-bit integer | None | Number of hinge points for cloud emissivity and reflectivity |
| emisIRInit | 32-bit floating-point | HingeSurfInit (= 50) | IR Surface Emissivities from initial regression (in order of increasing frequency. Only first numHingeSurfInit elements are valid) |
| rhoIRInit | 32-bit floating-point | HingeSurfInit (= 50) | IR Surface Reflectivities from initial regression (in order of increasing frequency. Only first numHingeSurfInit elements are valid) |
| olr | 32-bit floating-point | None | Outgoing Longwave Radiation Flux integrated over 2 to 2800 cm**-1 (Watts/m**2) |
| clrolr | 32-bit floating-point | None | Clear-sky Outgoing Longwave Radiation Flux integrated over 2 to 2800 cm**-1 (Watts/m**2) |
| cldFreq | 32-bit floating-point | Cloud (= 2) * HingeCloud (= 7) | Frequencies for cloud emissivity and reflectivity (in order of increasing pressure. Only first numCloud elements are valid) (in order of increasing frequency. Only first numHingeCloud elements are valid) |
| CldEmis | 32-bit floating-point | Cloud (= 2) * HingeCloud (= 7) | Ratio of cloud IR emissivity to that at 930 cm-1 (in order of increasing frequency. Only first numHingeCloud elements are valid) |
| CldRho | 32-bit floating-point | Cloud (= 2) * HingeCloud (= 7) | Future Cloud IR reflectivity -- DO NOT USE |
| CldEmisErr | 32-bit floating-point | Cloud (= 2) * HingeCloud (= 7) | Error estimate for CldEmis |
| CldRhoErr | 32-bit floating-point | Cloud (= 2) * HingeCloud (= 7) | Error estimate for CldRho |
| CldMapVis | 8-bit integer | AIRSTrack (= 3) * AIRSXTTrack (= 3) * VisTrack (= 9) * VisXTrack (= 8) | Map of clear/cloud pixel locations. (-1 = not known; 0 = clear; 1 = cloudy) |
| CldFrcVis | 8-bit integer | AIRSTrack (= 3) * AIRSXTTrack (= 3) | Integer percentage of Visible pixels in AIRS field-of-view identified as cloudy (-1/255 for unknown) |
| CldFrcVisErr | 8-bit integer | AIRSTrack (= 3) * AIRSXTTrack (= 3) | Error Estimate for CldFrcVis (percentage points) |
| ClrFrcVis | 8-bit integer | AIRSTrack (= 3) * AIRSXTTrack (= 3) | Integer percentage of Visible pixels in AIRS field-of-view identified as clear. (-1/255 for unknown) NOTE: because some pixels cannot be identified as either clear or cloudy CldFrcVis + ClrFrcVis may be less than 100. |
| ClrFrcVisErr | 8-bit integer | AIRSTrack (= 3) * AIRSXTTrack (= 3) | Error Estimate for ClrFrcVis (percentage points) |
| VarIndxAllVis | 8-bit integer | AIRSTrack (= 3) * AIRSXTTrack (= 3) | Variability index of all visible pixels in AIRS field-of-view (-1/255 for unknown) |
| VarIndxClrVis | 8-bit integer | AIRSTrack (= 3) * AIRSXTTrack (= 3) | Variability index of those visible pixels in AIRS field-of-view identified as clear (-1/255 for unknown) |
| rhoVis | 8-bit integer | AIRSTrack (= 3) * AIRSXTTrack (= 3) * VisTrack (= 9) * VisXTrack (= 8) * VChn (= 4) | Visible reflectivity integer percent (0 ... 100) (-1/255 for unknown) |
| cornerlats | 32-bit floating-point | AIRSTrack (= 3) * AIRSXTTrack (= 3) * VisGeoSpots (= 4) * VChn (= 4) | Geodetic Latitudes at the centers of the pixels at the corners of the IR footprint by channel in degrees North (-90.0 ... 90.0) |
| cornerlons | 32-bit floating-point | AIRSTrack (= 3) * AIRSXTTrack (= 3) * VisGeoSpots (= 4) * VChn (= 4) | Geodetic Longitudes at the centers of the pixels at the corners of the IR footprint by channel in degrees East (-180.0 ... 180.0) |
| fov_clear_flag | 8-bit integer | AIRSTrack (= 3) * AIRSXTTrack (= 3) | Preliminary clear flag based on MW/IR differences |
| fov_rad_resid | 32-bit floating-point | AIRSTrack (= 3) * AIRSXTTrack (= 3) | Preliminary residual between IR radiance and IR radiance predicted from MW |
| fov_psw_fr_lw_resid | 32-bit | AIRSTrack (= 3) * | Residual between shortwave radiance & shortwave radiance predicted |

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| | floating-point | AIRSTTrack (= 3) | from longwave |
| fov_psst_resid | 32-bit floating-point | AIRSTTrack (= 3) * AIRSTXTrack (= 3) | Residual between Surface Temperatures and those predicted from window channel observations |
| fov_swlw_resid | 32-bit floating-point | AIRSTTrack (= 3) * AIRSTXTrack (= 3) | residual between shortwave and longwave observations |
| fov_ocean_cc_test | 32-bit floating-point | CCTest (= 10) * AIRSTTrack (= 3) * AIRSTXTrack (= 3) | clear tests for Ocean, test 1 to 10: 1: Brightness temperature of 965.323 cm ⁻¹ ; 2: Sea Surface Temperature (SST) - brightness temperature of 965.323 cm ⁻¹ ; 3: Brightness temperature of 2616.095 cm ⁻¹ - predicted from 8 micron window observations; 4: Brightness temperature of 2616.095 cm ⁻¹ - predicted from 11 micron window observations; 5: SST - predicted SST from window channels; 6: Store the value of SST; 7 - 10: TBD |
| prelim_clear_flag | 8-bit integer | None | Preliminary clear flag based on IR spacial inhomogeneity |
| prelim_rad_dev | 32-bit floating-point | None | Preliminary deviations between fov_rad_resids within a 3x3 FOV retrieval array |
| tsurf_forecast | 32-bit floating-point | None | Predicted surface temperature from forecast (K) |
| tsurf_diff_4um | 32-bit floating-point | AIRSTTrack (= 3) * AIRSTXTrack (= 3) | Difference between SST predicted from AIRS 4 microns (2616 & 2707 cm ⁻¹) observations and SST from a forecast model (K) |
| tsurf_diff_11um | 32-bit floating-point | AIRSTTrack (= 3) * AIRSTXTrack (= 3) | Difference between SST predicted from AIRS 11 microns split window observations and SST from a forecast model, (K) |
| spatial_coh_4um | 32-bit floating-point | AIRSTTrack (= 3) * AIRSTXTrack (= 3) | This is the standard deviation of brightness temperature at 2616 cm ⁻¹ over 3X3 AIRS footprints as a measure of spatial homogeneity. |
| spatial_coh_11um | 32-bit floating-point | AIRSTTrack (= 3) * AIRSTXTrack (= 3) | This is the standard deviation of Difference between SST predicted from AIRS 11 microns split window observations and SST from a forecast model, (K) |
| cldHgtMapVis | 8-bit integer | AIRSTTrack (= 3) * AIRSTXTrack (= 3) * VisTrack (= 9) * VisXTrack (= 8) | Map of low-cloud pixel locations. (-1=unknown, 0=not low-cloud, 1=low-cloud.) |
| cldHgtCntVis | 8-bit integer | AIRSTTrack (= 3) * AIRSTXTrack (= 3) | Count of number of distinct cloud heights in visible data found in an AIRS field-of-view (-1/255 for unknown) |
| cldHgtCntVisErr | 8-bit integer | AIRSTTrack (= 3) * AIRSTXTrack (= 3) | Error estimate for cldHgtCntVis |
| TAirMWOnly | 32-bit floating-point | XtraPressureLev (= 100) | Air temperature in Kelvins from microwave-only retrieval |
| H2OCDMWOnly | 32-bit floating-point | XtraPressureLay (= 100) | Layer column water vapor from microwave-only retrieval (molecules / cm**2) |
| TAirMWOnlyErr | 32-bit floating-point | StdPressureLev (= 28) | Error estimate for TAirMWOnly (Note that error estimate only made at StdPressureLev points even though TAirMWOnly is estimated at XtraPressureLev points) |
| H2OCDMWOnlyErr | 32-bit floating-point | StdPressureLay (= 28) | Error estimate for H2OCDMWOnly (Note that error estimate only made at StdPressureLay points even though H2OCDMWOnly is estimated at XtraPressureLay points) |
| TSurf1Ret | 32-bit floating-point | None | Surface temperature after first retrieval in Kelvins |
| TSurfAir1Ret | 32-bit floating-point | None | Surface air temperature after first retrieval in Kelvins |
| TAir1Ret | 32-bit floating-point | XtraPressureLev (= 100) | Air temperature after first retrieval in Kelvins |
| H2OCD1Ret | 32-bit floating-point | XtraPressureLay (= 100) | Layer column water vapor after first retrieval (molecules / cm**2) |
| invalid | 8-bit integer | None | No valid output (1: True, 0: False, 255/-1: Unknown) |
| clear_flag | 8-bit integer | None | 1 for 100% clear, 0 for |
| MW_ret_used | 8-bit integer | None | MW-only final retrieval used (1: True, 0: False, 255/-1: Unknown) |
| retrieval_type | 8-bit integer | None | Deprecated -- use RetQAFlag. Retrieval type: 0 for full retrieval; 10 for MW + final succeeded, initial retrieval failed; 20 for MW + initial succeeded, final failed; 30 for only MW stage succeeded, initial + final retrieval failed; 40 for MW + initial succeeded, final cloud-clearing failed; 50 for only MW stage succeeded, initial + final cloud-clearing failed; 100 for no retrieval; |
| bad_l1b | 8-bit integer | None | Level 2 process not allowed due to bad level 1b data (1: True, 0: False, 255/-1: Unknown) |
| bad_l1b_amsu | 8-bit integer | None | Bad AMSU-A level 1b data (1: True, 0: False, 255/-1: Unknown) |
| bad_l1b_hsb | 8-bit integer | None | Bad HSB level 1b data (1: True, 0: False, 255/-1: Unknown) |
| bad_l1b_airs | 8-bit integer | None | Bad AIRS level 1b data (1: True, 0: False, 255/-1: Unknown) |

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| bad_l1b_vis | 8-bit integer | None | Bad VIS level 1b data (1: True, 0: False, 255/-1: Unknown) |
| forecast | 8-bit integer | None | Complete forecast guess was used (1: True, 0: False, 255/-1: Unknown) |
| no_psurf_guess | 8-bit integer | None | No surface pressure was available. Topography was used for surf press (1: True, 0: False, 255/-1: Unknown) |
| bad_temps | 8-bit integer | None | invalid temp and surface skin temp (1: True, 0: False, 255/-1: Unknown) |
| bad_h2o | 8-bit integer | None | invalid water vapor profile (1: True, 0: False, 255/-1: Unknown) |
| bad_o3 | 8-bit integer | None | invalid ozone profile (1: True, 0: False, 255/-1: Unknown) |
| bad_clouds | 8-bit integer | None | invalid cloud parameters (1: True, 0: False, 255/-1: Unknown) |
| bad_low_atm | 8-bit integer | None | invalid result below 100 mb (1: True, 0: False, 255/-1: Unknown) |
| no_tuning | 8-bit integer | None | Standard br temp tuning NOT applied (1: True, 0: False, 255/-1: Unknown) |
| no_ang_corr | 8-bit integer | None | Standard angle correction NOT applied (1: True, 0: False, 255/-1: Unknown) |
| no_mw | 8-bit integer | None | MW only retrieval not attempted (1: True, 0: False, 255/-1: Unknown) |
| no_initial | 8-bit integer | None | First retrieval not attempted (1: True, 0: False, 255/-1: Unknown) |
| no_final | 8-bit integer | None | Final retrieval not attempted (1: True, 0: False, 255/-1: Unknown) |
| mw_fpe | 8-bit integer | None | floating-point exception in MW retrieval step (1: True, 0: False, 255/-1: Unknown) |
| initial_fpe | 8-bit integer | None | floating-point exception in Initial retrieval step (1: True, 0: False, 255/-1: Unknown) |
| final_fpe | 8-bit integer | None | floating-point exception in Final retrieval step (1: True, 0: False, 255/-1: Unknown) |
| MWPrecip | 8-bit integer | None | Precipitation was detected over 0.5 mm/hr (1: True, 0: False, 255/-1: Unknown) |
| MWsurf_R0 | 32-bit floating-point | None | internal adjustment parameter -- surface R0 |
| MWsurf_T0 | 32-bit floating-point | None | internal adjustment parameter -- surface T0 |
| MWsurf_Tinf | 32-bit floating-point | None | internal adjustment parameter -- surface Tinfinity |
| MWseaice_conc | 32-bit floating-point | None | ice or snow concentration (0-1) |
| MWresidual_temp | 32-bit floating-point | None | sum of squares of temperature residuals normalized by channel sensitivities |
| MWresidual_mois | 32-bit floating-point | None | sum of squares of moisture residuals normalized by channel sensitivities |
| MWresidual_AMSUA | 32-bit floating-point | ChanAMSUA (= 15) | Brightness temperature residual for each AMSU-A channel (Kelvin) |
| MWresidual_HSB | 32-bit floating-point | ChanHSB (= 5) | brightness temperature residual for each HSB channel (Kelvin) |
| MWiter_temp | 8-bit integer | None | # of iterations of the temperature profile (-1/255 for Unknown) |
| MWiter_mois | 8-bit integer | None | # of iterations of the moisture profile (-1/255 for Unknown) |
| mw_ret_code | 8-bit integer | None | Return code status of MW retrieval: 0: Useable MW retrieval; >0: Unuseable MW retrieval; 1: Reject due to high residuals in one or more valid channels; 2 Not enough valid channels to retrieve; 3 Non-positive definite moisture/surface retrieval; 4 Non-positive definite temperature retrieval; -1/255 Unknown |
| cloud_ice | 8-bit integer | None | Scattering by cloud ice present in FOV (1: True, 0: False, 255/-1: Unknown) |
| icc_too_cloudy | 8-bit integer | None | Initial cloud clearing pass too cloudy (1: True, 0: False, 255/-1: Unknown) |
| icc_low_contrast | 8-bit integer | None | Initial cloud clearing pass contrast too low (1: True, 0: False, 255/-1: Unknown) |
| icc_bad_rad | 8-bit integer | None | Initial cloud clearing pass cloud cleared radiances do not match clear guess - reject the IR retrieval (1: True, 0: False, 255/-1: Unknown) |
| icc_percent_cld | 8-bit integer | None | Initial cloud clearing cloudy percent (-1/255 for Unknown) |
| icc_contrast | 32-bit floating-point | None | Initial cloud clearing contrast (units?) |
| bad_1st | 8-bit integer | None | The initial retrieval failed (1: True, 0: False, 255/-1: Unknown) |
| bad_1st_cc | 8-bit integer | None | The first cloud clearing failed (1: True, 0: False, 255/-1: Unknown) |
| bad_1st_regres | 8-bit integer | None | The regression guess failed (1: True, 0: False, 255/-1: Unknown) |

| | | | |
|------------------|-----------------------|------|--|
| bad_1st_phys | 8-bit integer | None | The first physical retrieval failed (1: True, 0: False, 255/-1: Unknown) |
| fcc_too_cloudy | 8-bit integer | None | Final cloud clearing pass too cloudy (1: True, 0: False, 255/-1: Unknown) |
| fcc_low_contrast | 8-bit integer | None | Final cloud clearing pass contrast too low (1: True, 0: False, 255/-1: Unknown) |
| fcc_bad_rad | 8-bit integer | None | Final cloud clearing pass cloud cleared radiances do not match clear guess - reject the IR retrieval (1: True, 0: False, 255/-1: Unknown) |
| fcc_percent_cld1 | 8-bit integer | None | Final cloud clearing cloudy percent pass 1 (-1/255 for Unknown) |
| fcc_percent_cld2 | 8-bit integer | None | Final cloud clearing cloudy percent pass 2 (-1/255 for Unknown) |
| fcc_contrast1 | 32-bit floating-point | None | Final cloud clearing contrast (units?) pass 1 |
| fcc_contrast2 | 32-bit floating-point | None | Final cloud clearing contrast (units?) pass 2 |
| bad_final | 8-bit integer | None | Final retrieval failed (1: True, 0: False, 255/-1: Unknown) |
| bad_final_cc | 8-bit integer | None | final cloud clearing failed (1: True, 0: False, 255/-1: Unknown) |
| bad_final_ir | 8-bit integer | None | final IR retrieval failed (1: True, 0: False, 255/-1: Unknown) |
| bad_final_surf | 8-bit integer | None | final surface ret failed (1: True, 0: False, 255/-1: Unknown) |
| bad_final_temp | 8-bit integer | None | final temp ret failed (1: True, 0: False, 255/-1: Unknown) |
| bad_final_h2o | 8-bit integer | None | final water vapor ret failed (1: True, 0: False, 255/-1: Unknown) |
| bad_final_o3 | 8-bit integer | None | final ozone ret failed (1: True, 0: False, 255/-1: Unknown) |
| bad_final_cloud | 8-bit integer | None | final cloud ret failed (1: True, 0: False, 255/-1: Unknown) |
| bad_cc_cld_ret | 8-bit integer | None | Cloud clearing and cloud ret are inconsistent (1: True, 0: False, 255/-1: Unknown) |
| MW_IR_ret_differ | 8-bit integer | None | Microwave and IR temperature retrieval differ too much - reject final IR retrieval (1: True, 0: False, 255/-1: Unknown) |
| bad_MW_low_resid | 8-bit integer | None | Microwave residuals in lower atmosphere too large - reject final IR retrieval (1: True, 0: False, 255/-1: Unknown) |
| MW_low_atm_resid | 32-bit floating-point | None | MW residual for lower atmosphere after final retrieval |
| final_AMSU_ret | 8-bit integer | None | 0 for success; 1 for did not converge; 2 for residual too large |
| final_HSB_ret | 8-bit integer | None | 0 for success; 1 for did not converge; 2 for residual too large |
| final_cloud_ret | 8-bit integer | None | 0 for success; 1 for did not converge; 2 for residual too large |
| final_surf_ret | 8-bit integer | None | 0 for success; 1 for did not converge; 2 for residual too large |
| final_temp_ret | 8-bit integer | None | 0 for success; 1 for did not converge; 2 for residual too large |
| final_h2o_ret | 8-bit integer | None | 0 for success; 1 for did not converge; 2 for residual too large |
| final_o3_ret | 8-bit integer | None | 0 for success; 1 for did not converge; 2 for residual too large |
| final_ch4_ret | 8-bit integer | None | 0 for success; 1 for did not converge; 2 for residual too large |
| final_co_ret | 8-bit integer | None | 0 for success; 1 for did not converge; 2 for residual too large |
| final_co2_ret | 8-bit integer | None | 0 for success; 1 for did not converge; 2 for residual too large |
| low_sun | 8-bit integer | None | solar zenith angle > 60 degrees (1: True, 0: False, 255/-1: Unknown) |
| wide_ang | 8-bit integer | None | viewing angle at center of AIRS spot > 50 degrees (1: True, 0: False, 255/-1: Unknown) |
| vis_glint | 8-bit integer | None | sun-glint is expected to alter radiances for any water surfaces in the AMSU FOV by at least 5%. (No test is made, however, for whether any water is actually located within the FOV.) (1: True, 0: False, 255/-1: Unknown) |
| bad_vis_rad | 8-bit integer | None | Vis/NIR radiance out of range (1: True, 0: False, 255/-1: Unknown) |
| bad_vis_cal | 8-bit integer | None | Vis/NIR calibration data old or invalid (1: True, 0: False, 255/-1: Unknown) |
| bad_vis_det_temp | 8-bit integer | None | Vis/NIR Detector temperature out of range (1: True, 0: False, 255/-1: Unknown) |
| bad_scan_hd_temp | 8-bit integer | None | Scan Head Assembly temperature out of range (1: True, 0: False, 255/-1: Unknown) |
| bad_vis_cld_det | 8-bit integer | None | Cloud detection failed (1: True, 0: False, 255/-1: Unknown) |
| bad_vis_cld_hgt | 8-bit integer | None | Cloud height failed (1: True, 0: False, 255/-1: Unknown) |
| bad_ref_NDVI | 8-bit integer | None | Bad reference Normalized Differential Vegetation Index (1: True, 0: False, 255/-1: Unknown) |
| bad_vis_var | 8-bit integer | None | Variability index invalid (1: True, 0: False, 255/-1: Unknown) |

| | | | |
|----------------------|-----------------------|-------------------|--|
| vis_clear | 8-bit integer | None | at least 97.2% of each IR FOV within the AMSU FOV is clear sky (1: True, 0: False, 255/-1: Unknown) |
| vis_cloudy | 8-bit integer | None | at least 79.2% of each IR FOV within the AMSU FOV is cloudy (1: True, 0: False, 255/-1: Unknown) |
| vis_low_cloud | 8-bit integer | None | at least 79.2% of each IR FOV within the AMSU FOV is low_cloud (1: True, 0: False, 255/-1: Unknown) |
| Initial_CC_score | 32-bit floating-point | None | Indicator of how well the initial cloud-cleared radiances match radiances reconstructed from clear eigenvectors. (0.0 for a perfect match; 10.0 indicates a major problem) |
| Initial_CC_subscores | 32-bit floating-point | ScoresBand (= 10) | Sub-scores contributing to Initial_CC_score, by frequency band |

Size: 18141300 bytes (18.1 MB) per 45-scanset granule

**Total File Size (plus storage for dimensions and other HDF-EOS overhead):
18180287 bytes (18.2 MB) per 45-scanset granule = 4363.3 MB per day**

Special AIRS Types

Limited Engineering Struct: This type is used for engineering data fields for which there are known "yellow" limits

| Field Name | Type | Explanation |
|------------|-----------------------|--|
| min | 32-bit floating-point | Minimum value field takes on in granule (not valid when num_in = 0) |
| max | 32-bit floating-point | Maximum value field takes on in granule (not valid when num_in = 0) |
| mean | 32-bit floating-point | Mean of in-range values field takes on in granule (not valid when num_in = 0) |
| dev | 32-bit floating-point | Standard Deviation of in-range values field takes on in granule (not valid when num_in = 0) |
| num_in | 32-bit integer | Count of in-range values field takes on in granule |
| num_lo | 32-bit integer | Count of out-of-range low values field takes on in granule |
| num_hi | 32-bit integer | Count of out-of-range high values field takes on in granule |
| num_bad | 32-bit integer | Count of occasions on which field takes on invalid flag value (-9999) in granule |
| range_min | 32-bit floating-point | Minimum in-range value. Any value less than this is counted in num_lo and is not used in the calculation of mean & dev. |
| range_max | 32-bit floating-point | Maximum in-range value. Any value greater than this is counted in num_hi and is not used in the calculation of mean & dev. |
| missing | 8-bit integer | Missing limits flags. Bit 0 (LSB) is 1 when yellow low (range_min) limit is missing; Bit 1 is high when yellow high (range_max) limit is missing; other bits unused, set to 0. |
| max_track | 32-bit integer | GeoTrack index (counting from 1) where max was found |
| max_xtrack | 32-bit integer | GeoXTrack index (counting from 1) where max was found |
| min_track | 32-bit integer | GeoTrack index (counting from 1) where min was found |
| min_xtrack | 32-bit integer | GeoXTrack index (counting from 1) where min was found |

Unlimited Engineering Struct: This type is used for engineering data fields for which there are NOT known "yellow" limits

| Field Name | Type | Explanation |
|------------|-----------------------|---|
| min | 32-bit floating-point | Minimum value field takes on in granule (not valid when num = 0) |
| max | 32-bit floating-point | Maximum value field takes on in granule (not valid when num = 0) |
| mean | 32-bit floating-point | Mean of values field takes on in granule (not valid when num = 0) |
| dev | 32-bit floating-point | Standard Deviation of values field takes on in granule (not valid when num = 0) |
| num | 32-bit integer | Count of occurrences of field in granule (not including those counted in num_bad) |
| num_bad | 32-bit integer | Count of occasions on which field takes on invalid flag value (-9999) in granule |
| max_track | 32-bit integer | GeoTrack index (counting from 1) where max was found |
| max_xtrack | 32-bit integer | GeoXTrack index (counting from 1) where max was found |
| min_track | 32-bit integer | GeoTrack index (counting from 1) where min was found |
| min_xtrack | 32-bit integer | GeoXTrack index (counting from 1) where min was found |

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A1-18. L2 Retrieval Browse Subset Interface Specification

Interface Specification Version 3.0.4.0
2003-05-19

ESDT ShortName = "AIRX2RBS"

Swath Name = "L2_Ret_Browse_Subset"

Level = "level2"

Footprints = 30

scanlines per scanset = 1

Dimensions

These fields define all dimensions that can be used for HDF-EOS swath fields.

The names "GeoTrack" and "GeoXTrack" have a special meaning for this document: "Cross-Track" data fields have a hidden dimension of "GeoXTrack"; "Along-Track" data fields have a hidden dimension of "GeoTrack"; "Full Swath Data Fields" have hidden dimensions of both "GeoTrack" and "GeoXTrack".

| Name | Value | Explanation |
|-----------------|--------------------------|---|
| GeoXTrack | 30 | Dimension across track for footprint positions. Same as number of footprints per scanline. -- starting at the left and increasing towards the right as you look along the satellite's path |
| GeoTrack | # of scan lines in swath | Dimension along track for footprint positions. Same as number of scanlines in granule. Parallel to the satellite's path, increasing with time. (Nominally 45 for Level-2, AMSU-A, and AIRS/Vis low-rate engineering; 135 for AIRS/Vis and HSB high-rate quantities) |
| Num_IR_Emis_Sub | 4 | Dimension of IR emissivity array. Emissivities associated with four IR frequencies; 800; 1000; 1200; and 2400 cm-1 |

Geolocation Fields

These fields appear for every footprint (GeoTrack * GeoXTrack times) and correspond to footprint center coordinates and "shutter" time.

| Name | Explanation |
|-----------|--|
| Latitude | Footprint boresight geodetic Latitude in degrees North (-90.0 ... 90.0) |
| Longitude | Footprint boresight geodetic Longitude in degrees East (-180.0 ... 180.0) |
| Time | Footprint "shutter" TAI Time: floating-point elapsed seconds since Jan 1, 1993 |

Size: 32400 bytes (0.0 MB) per 45-scanset granule

Along-Track Data Fields

These fields appear once per scanline (GeoTrack times)

| Name | Type | Extra Dimensions | Explanation |
|----------------|---------------|------------------|---|
| scan_node_type | 8-bit integer | None | 'A' for ascending, 'D' for descending, 'N' for North-Polar, 'S' for South-Polar |

Size: 45 bytes (0.0 MB) per 45-scanset granule

Full Swath Data Fields

These fields appear for every footprint of every scanline in the granule (GeoTrack * GeoXTrack times)

| Name | Type | Extra Dimensions | Explanation |
|-------------------|------------------------|------------------|--|
| scanang | 32-bit floating-point | None | Scanning angle of AIRS instrument with respect to the spacecraft for this footprint (-180.0 ... 180.0, negative at start of scan, 0 at nadir) |
| MW_quality_flag | 8-bit unsigned integer | None | QA on Level-2 Microwave-only retrieval: Bit 7 (MSB): The MW only retrieval failed; Bit 6: The MW only surface ret failed; Bit 5: The MW only temp ret failed; Bit 4: The MW only water vapor ret failed; Bit 3: Precipitation present in FOV; Bit 2: Cloud ice present in FOV; Bit 1: Zero fill, spare; Bit 0 (LSB): Bit OR of above seven bits |
| AIRS_quality_flag | 8-bit unsigned integer | None | QA on Level-2 Final retrieval: Bit 7 (MSB): The Final retrieval failed; Bit 6: The final cloud clearing failed; Bit 5: The final surface ret failed; Bit 4: The final temp ret failed; Bit 3: The final water vapor ret failed; Bit 2: The final ozone ret failed; Bit 1: The final cloud ret failed; Bit 0 (LSB): Cloud clearing and cloud ret are inconsistent |
| AIRS_Cloud_Pct1 | 32-bit floating-point | None | Cloud fraction for first (top) cloud layer (0.0 ... 1.0) |
| AIRS_Cloud_Pct2 | 32-bit floating-point | None | Cloud fraction for second (bottom) cloud layer (0.0 ... 1.0) |

| | | | |
|---------------------------|-----------------------|-----------------------|--|
| AIRS_nCloudLayers | 32-bit integer | None | Number of cloud layers |
| SST_Retrieved | 32-bit floating-point | None | Surface skin temperature in Kelvins |
| Tot_WaterVapor_Burden_Ret | 32-bit floating-point | None | Total water vapor burden (kg / m**2) |
| Tot_LiqWater_Burden_Ret | 32-bit floating-point | None | Total liquid water burden (kg / m**2) |
| Total_O3_Burden_Retrieved | 32-bit floating-point | None | Total ozone burden (Dobson units) |
| IR_Emissivity | 32-bit floating-point | Num_IR_Emis_Sub (= 4) | IR Emissivity |
| MW_FirstGuess_Tot_Liq_H2O | 32-bit floating-point | None | Total liquid water from microwave-only retrieval (kg / m**2) |
| MW_Rain_Rate | 32-bit floating-point | None | Rain rate (mm/hr) |
| VIS_Pct_Clear | 8-bit integer | None | Percent area identified as clear by the Vis/NIR Level 2 cloud detection algorithm |
| VIS_Var_Index | 8-bit integer | None | Variability index of visible pixels (standard deviation of AIRS Vegetation Index, expressed as a percent of the mean vegetation index) |

Size: 81000 bytes (0.1 MB) per 45-scanset granule

Total File Size (plus storage for dimensions and other HDF-EOS overhead): 113445 bytes (0.1 MB) per 45-scanset granule = 27.2 MB per day

A1-19. L2 Cloud-Cleared Browse Subset Interface Specification

Interface Specification Version 3.0.4.0
2003-05-19

ESDT ShortName = "AIRI2CBS"

Swath Name = "L2_CC_Browse_Subset"

Level = "level2"

Footprints = 30

scanlines per scanset = 1

Dimensions

These fields define all dimensions that can be used for HDF-EOS swath fields.

The names "GeoTrack" and "GeoXTrack" have a special meaning for this document: "Cross-Track" data fields have a hidden dimension of "GeoXTrack"; "Along-Track" data fields have a hidden dimension of "GeoTrack"; "Full Swath Data Fields" have hidden dimensions of both "GeoTrack" and "GeoXTrack".

| Name | Value | Explanation |
|-----------|--------------------------|---|
| GeoXTrack | 30 | Dimension across track for footprint positions. Same as number of footprints per scanline. -- starting at the left and increasing towards the right as you look along the satellite's path |
| GeoTrack | # of scan lines in swath | Dimension along track for footprint positions. Same as number of scanlines in granule. Parallel to the satellite's path, increasing with time. (Nominally 45 for Level-2, AMSU-A, and AIRS/Vis low-rate engineering; 135 for AIRS/Vis and HSB high-rate quantities) |

Geolocation Fields

These fields appear for every footprint (GeoTrack * GeoXTrack times) and correspond to footprint center coordinates and "shutter" time.

| Name | Explanation |
|-----------|--|
| Latitude | Footprint boresight geodetic Latitude in degrees North (-90.0 ... 90.0) |
| Longitude | Footprint boresight geodetic Longitude in degrees East (-180.0 ... 180.0) |
| Time | Footprint "shutter" TAI Time: floating-point elapsed seconds since Jan 1, 1993 |

Size: 32400 bytes (0.0 MB) per 45-scanset granule

Along-Track Data Fields

These fields appear once per scanline (GeoTrack times)

| Name | Type | Extra Dimensions | Explanation |
|----------------|---------------|------------------|---|
| scan_node_type | 8-bit integer | None | 'A' for ascending, 'D' for descending, 'N' for North-Polar, 'S' for South-Polar |

Size: 45 bytes (0.0 MB) per 45-scanset granule

Full Swath Data Fields

These fields appear for every footprint of every scanline in the granule (GeoTrack * GeoXTrack times)

| Name | Type | Extra Dimensions | Explanation |
|--------------|-------------------------|------------------|---|
| scanang | 32-bit floating-point | None | Scanning angle of AIRS instrument with respect to the spacecraft for this footprint (-180.0 ... 180.0, negative at start of scan, 0 at nadir) |
| quality_flag | 32-bit unsigned integer | None | Quality Flag (TBD) |
| AIRS_T_200mb | 32-bit floating-point | None | Radiance of AIRS Temperature sounding channel at 200 mb (milliWatts/m**2/cm**-1/steradian) |
| AIRS_O3 | 32-bit floating-point | None | Radiance of AIRS ozone channel (milliWatts/m**2/cm**-1/steradian) |
| AIRS_Window | 32-bit floating-point | None | Radiance of AIRS "window" (surface) channel (milliWatts/m**2/cm**-1/steradian) |
| AIRS_CH4 | 32-bit floating-point | None | Radiance of AIRS methane channel (milliWatts/m**2/cm**-1/steradian) |
| AIRS_H2O | 32-bit floating-point | None | Radiance of AIRS water channel (milliWatts/m**2/cm**-1/steradian) |

Size: 37800 bytes (0.0 MB) per 45-scanset granule

Total File Size (plus storage for dimensions and other HDF-EOS overhead): 70245 bytes (0.1 MB) per 45-scanset granule = 16.9 MB per day

Appendix A2. Summary Browse Product Interface Specifications

AIRS Browse products are used as an aid to ordering AIRS data from the DAAC via the EOS Data Gateway (EDG). The user cycles through the AIRS Browse images for a high-level view of AIRS data products. The user may order AIRS science granules that correspond to features found in the browse images.

The AIRS Summary browse products represent a twice-daily global snapshot of one day's AIRS observations. The daily browse products will have "gores" between the satellite paths where there is no coverage for that day.

Each summary browse product file consists of several unsigned 8-bit arrays. Each array is a 180 x 360 two-dimensional global map of the Earth's surface at 1° x 1° resolution using a rectilinear projection. Each grid cell is a 1° x 1° square bounded by latitude and longitude lines. The longitudinal extent is from -180.0° to +180.0° with the prime meridian in the center of the image. The files are in HDF RIS8 (8-bit raster) format, and for each image within the file there is an associated color palette. Additionally, for each image there are descriptive annotations in HDF DFAN format. The annotations consist of image title, image description, and the minimum, mean, and maximum of the original data values and the corresponding pixel values. The minimum and maximum of the original data values may be used to annotate a color bar.

Each array element has a value between 0 and 199 and is a re-scaled representation of a floating-point number (visible images are integer). The relationship between pixel value (pv) and input floating point data value (dv) is:

$$pv = (dv - \text{minimum_dv}) * (199 / (\text{maximum_dv} - \text{minimum_dv})) + 1$$

The AIRS summary browse product consists of five (5) summary browse package types, separated for ascending or descending orbital passes. A total of ten (10) AIRS summary browse package files are produced once per day. The products are associated with AIRS processing levels and instrument outputs of the AIRS science granules. The five AIRS summary product package types are described below.

1. **AIRHBDBR** - HSB Level 1B summary browse package type

AIRHBDBR consists of pixel representations of HSB Level 1B calibrated observed brightness temperatures. A limb adjustment algorithm is applied before the data values are converted to pixel values. AIRHBDBR contains 4 image arrays corresponding to 4 HSB channels (f0 = 183.31 GHz):

- 150.0 GHz (HSB Channel 2)
- f0 +/- 1.0 GHz (HSB Channel 3)
- f0 +/- 3.0 GHz (HSB Channel 4)
- f0 +/- 7.0 GHz (HSB Channel 5)

2. **AIRABDBR** - AMSU-A Level 1B summary browse package type

AIRABDBR consists of pixel representations of AMSU-A Level 1B calibrated observed brightness temperatures. AIRABDBR is limb adjusted. AIRABDBR contains 8 image arrays corresponding to 8 AMSU-A channels (Center freq. GHz):

- 23.8 GHz (AMSU-A Channel 1)

- 31.4 GHz (AMSU-A Channel 2)
- 50.3 GHz (AMSU-A Channel 3)
- 52.8 GHz (AMSU-A Channel 4)
- 53.596 +/- .115 GHz (AMSU-A Channel 5)
- 54.4 GHz (AMSU-A Channel 6)
- 54.94 GHz (AMSU-A Channel 7)
- 89.0 GHz (AMSU-A Channel 15)

3. **AIRIBDBR** - AIRS Level 1B summary browse package type

AIRIBDBR consists of pixel representations of AIRS Level 1B calibrated observed radiances that have been converted to brightness temperature to increase the range of values. No limb adjustment is applied. AIRIBDBR contains 5 image arrays corresponding to 5 AIRS channels:

- 709.74 (200 mb temperature sensing channel)
- 1040.14 (ozone sensing channel)
- 1109.49 (window channel)
- 1304.23 (methane channel)
- 1310.06 (water vapor sensing channel)

If, for any reason, any of the primary channels above are not available, each of the channels has a secondary option. The secondary channels are: 702.86, 1036.45, 1103.24, 1304.81, and 1330.90.

4. **AIRI2DBR** - AIRS Level 2 cloud-cleared radiance summary browse package type

AIRI2DBR consists of pixel representations of selected AIRS Level 2 cloud cleared radiances that have been converted to brightness temperature to increase the range of values. No limb adjustment is applied. The cloud-cleared radiance product is the infrared radiance emitted from cloud-free retrieved profiles, $\text{mWm}^{**2}/\text{cm}^{**}-1/\text{steradian}$. A single spectrum is derived from a suite of nine AIRS infrared spectra, nine HSB spectra and one AMSU-A spectrum. AIRI2DBR contains 5 image arrays corresponding to 5 AIRS channels:

- 709.74 (200 mb temperature sensing channel)
- 1040.14 (ozone sensing channel)
- 1109.49 (window channel)
- 1304.23 (window channel)
- 1310.06 (water vapor sensing channel)

If, for any reason, any of the primary channels above are not available, each of the channels has a secondary option. The secondary channels are: 702.86, 1036.45, 1103.24, 1304.81, and 1330.90.

5. **AIRX2DBR** - Level 2 retrieval summary browse package type

AIRX2DBR consists of pixel representations of selected AIRS Level 2 retrieved quantities. AIRX2DBR consists of 8 image arrays for ascending (daytime) nodes or 6 images for descending (night time) nodes for the following retrieved products:

- Cloud Percent
- Skin Surface Temperature (SST)
- Total Water Vapor Burden

- Total Ozone Burden
- Microwave First Guess Liquid Water
- Microwave Rain Rate
- Visible Percent Clear (Ascending Node Only)
- Visible Variability Index (Ascending Node Only)

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Appendix A3. Level 1A AIRS Engineering Archival Product Format Specification

The Level 1A AIRS software produces one archival product file per granule: a high-rate engineering archival product (AIRIHRE).

This product is in HDF-EOS swath format. Each file may contain more than one swath. The swaths are named according to the following convention:

Fixed-format packets: APID-xxx
Flexible-format packets: APID-xxx.EDF-y
where
xxx is the APID
y is the Engineering Data Format (Engineering Format Parameter).

For example, a nominal high-rate archival product, with only fixed engineering packets and no passive analog information, contains two swaths: APID-414 and APID-415; whereas, with flexible packets EDF 1, it will have APID-416.EDF-1 and APID-417.EDF-1.

Geolocation fields contain spacecraft Latitude/Longitude/TAI time once per packet.

The name of each parameter from the engineering packets is the mnemonic, used in the decommutation map, with the leading 7 characters ("AIR_xy_") removed.

The first dimension of all parameters is "GeoTrack," the number of packets received of that APID/EDF combination.

In cases where a mnemonic appears more than once in a decommutation map ("oscilloscope mode" or "supercommutation"), that parameter has a second array dimension, matching the number of occurrences of that mnemonic in the decommutation map.

The high-rate engineering product has one additional swath to hold the values reported as "passive analog." It is named "APID-511" and always contains one each of the following 12 passive analog fields for every 8-second scanset, spanned by the granule:

| | |
|------------|--|
| COMP A | Cooler A Baseplate Temperature |
| COMP B | Cooler B Baseplate Temperature |
| COOLERA | Cooler A Electronics Temperature |
| COOLERB | Cooler B Electronics Temperature |
| INSTA | Instrument Electronics Baseplate A Temperature |
| INSTB | Instrument Electronics Baseplate B Temperature |
| SCANHEAD A | Scan Head Housing A Temperature |
| SCANHEAD B | Scan Head Housing B Temperature |
| SPECA | Spectrometer A Temperature (valid above 250 K) |
| SPECB | Spectrometer B Temperature (valid above 250 K) |
| SPECASS4 | Spectrometer A Temperature (valid below 250 K) |
| SPECBSS4 | Spectrometer B Temperature (valid below 250 K) |

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Appendix A4. AIRS Engineering Granule Summary Product Format Specification

The Level 1A AIRS software produces an engineering granule summary product (AIRIAHRS) for each granule.

This file contains one swath, named "Sum_AIRS_Eng," that summarizes the behavior of engineering fields in high-rate fixed format engineering packets (APIDs 414 & 415) over a six-minute period.

This swath has integer attributes LatGranuleCen, LonGranuleCen, and LocTimeGranuleCen, giving latitude, longitude, and local solar time at granule center in minutes past midnight.

Geolocation fields contain spacecraft Latitude/Longitude/TAI Time once per scan.

The main portion of the swath is twelve parallel array fields, with one entry per engineering field:

mnemonic - The mnemonic of the field as present in the decommutation map, with the leading 7 characters ("AIR_xy_") removed.

min - The minimum of all values of the parameter that fall between range_min and range_max.

max - The maximum of all values of the parameter that fall between range_min and range_max.

mean - The mean of all values of the parameter that fall between range_min and range_max.

dev - The standard deviation of all values of the parameter that fall between range_min and range_max.

num_in - The number of values of the parameter that fall between range_min and range_max.

num_lo - The number of values of the parameter that fall below range_min.

num_hi - The number of values of the parameter that fall above range_max.

num_bad - The number of values of the parameter that are invalid (-9999 or NaN).

range_min - The minimum value of this parameter considered valid.

range_max - The maximum value of this parameter considered valid.

missing - Missing limits flags. Bit 0 (LSB) is 1 when yellow low (range_min) limit is missing; Bit 1 is high when yellow high (range_max) limit is missing; other bits unused, set to 0.

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Appendix A5. AIRS-Suite Radiosonde Matchup Product Interface Specification

The AIRS-Suite Radiosonde matchup file (AIRX2MAT) interface is the special case of the AIRS-Suite Truth Matchup Interface below, where Truth_File_Type is PREPQC.ADPUPA.

Each matchup file will be in HDF-EOS swath format. It can contain up to eight swaths as follows:

- L1B_AIRS_Science
- L1B_VIS_Science
- L1B_AMSU
- L1B_HSB
- L2_Standard_atmospheric&surface_product
- L2_Support_atmospheric&surface_product
- L2_Standard_cloud-cleared_radiance_product
- Matchup_Info
- GCML2
- GCMMatchup

Any number of these swaths may be missing, but, if present, all have the same size on their primary dimension (GeoTrack). There is a one-to-one correspondence between items at the same GeoTrack index in each swath.

The dimension GeoTrack has a slightly different meaning for swaths in the matchup file than for swaths in standard AIRS PGE products. For the latter files, it corresponds to the number of instrument scans that took place during the period when this data was being collected. For the matchup file, it means the total number of AIRS-suite profiles ("golfballs") contained in the file. Because this file is a collection of profiles for which truth matches happened to be found, no assumptions should be made about the geographic relations between profiles.

Except for GCML2, GCMMatchup, and Matchup_Info, each swath follows the interface specification in the "AIRS Processing Files Description" document for the corresponding swath file with the following changes:

- All Attributes (which are once per file in the standard swath files) become fields with dimensions GeoTrack + listed Extra Dimensions.
- For "big-spot" swaths (L1B_AMSU, all L2):
 - Dimension GeoXTrack is removed.
 - Fields which were Along-Track have the same dimensions (GeoTrack + listed Extra Dimensions)
 - Fields which were Full Swath have the same dimensions, except that the second dimension (GeoXTrack) is removed. (Dimensions are now GeoTrack + listed Extra Dimensions.)
- For "small-spot" swaths (L1B_HSB, L1B_AIRS_Science, L1B_VIS_Science):
 - Dimension GeoXTrack is replaced by SubTrack3x3 and SubXTrack3x3 (both always set to 3).
 - Fields which were Along-Track have one extra dimension inserted after GeoTrack, SubTrack3x3. (Dimensions are now GeoTrack, SubTrack3x3 + listed Extra Dimensions.)
 - Fields which were Full Swath have the same dimensions except that the second dimension (GeoXTrack) is replaced by two dimensions, SubTrack3x3, SubXTrack3x3.

(Dimensions are now GeoTrack,SubTrack3x3,SubXTrack3x3 + listed Extra Dimensions.)

- There are two additional 32-bit integer fields dimensioned GeoTrack.
 - start_scan_line_number contains the scan line number (1-based) of the first footprint in its original granule. (GeoTrack)
 - start_footprint_number contains the footprint number (1-based) of the first footprint in its original granule. (GeoXTrack)
- Geolocation Fields have only the dimension GeoTrack. For small-spot swaths this corresponds to the center footprint. These small-spot swaths have additional 64-bit floating-point Full Swath fields named footprint_latitude, footprint_longitude, and footprint_taitime which contain the per-footprint geolocation information.
- The fields listed below are removed because they give granule-level information that is not useful in a matchup context (When '*' is the last character then it matches all fields with that start of a name.):
 - num_*
 - processing_level
 - instrument
 - AutomaticQAFlag
 - NumTotalData
 - NumProcessData
 - NumMissingData
 - NumSpecialData
 - NumBadData
 - node_type
 - start_year
 - start_month
 - start_day
 - start_hour
 - start_minute
 - start_sec
 - start_Latitude
 - start_Longitude
 - start_Time
 - end_Latitude
 - end_Longitude
 - end_Time
 - nadirTAI
 - stat_*
 - QA_*
 - granules_present
 - gain_fit_dev
 - rad_stats
 - rad_scan_stats
 - rad_unc_stats
 - offset_unc_stats
 - offset_stats
 - limit_offsets
 - offset_fit_dev
 - input_*
 - nen_stat
 - polar_stat
 - limit_*

- offset_begin
- offset_end
- offset_err
- gain
- offset
- nominal_freq
- spectral_freq_prev
- DCR_*
- effective_bb_temp
- nadir_contrast
- spec_*
- gain_*
- bulb_failed
- K21," "K32," "K31," "K_factors_applied
- gamma_*
- track_err
- xtrack_err
- align_*
- cal_coef_*
- IF_offset_*
- bandwidth
- center_freq
- CalGranSummary
- ExcludedChans
- CalScanSummary
- SpaceViewDelta
- spaceview_selection
- NumRefChannels
- RefChannels
- NumLandSurface
- NumOceanSurface
- start_orbit_row
- end_orbit_row
- eq_x_longitude
- eq_x_tai
- LonGranuleCen
- LatGranuleCen
- LocTimeGranuleCen
- MoonInViewMWCount
- CalGranSummary
- DCRCount
- PopCount
- VISDarkAMSUFOVCount
- VISBrightAMSUFOVCount
- primary_bulb
- secondary_bulb
- backup_bulb
- NumVisInvalid
- NumMWStratIrRetOnly

The Matchup_Info swath will have the swath attributes described in Table 2:

Table 2. Matchup_Info Swath Attributes

| <i>Name</i> | <i>Type</i> | <i>Explanation</i> |
|-----------------------------|----------------------------|--|
| Truth_File_Type | String of 8-bit characters | Free-format text (up to 80 characters) giving matchup criteria for Truth_Type. For example, match-all, match-exact: TYP:120,match-substring:T29:11,exclude-substring:ITP:52,exclude-exact:T29:11. |
| Modification_History | String of 8-bit characters | Free-format text (up to 80 characters) gives the modification history of this file. For instance, it might contain "hand-modified by EMM to increase time window for ocean records." Suggested value is "N/A" for no modification. |

Matchup_Info contains space for up to 5 matches for each value of GeoTrack. This reflects the possibility that more than one truth record can be within the specified time and distance window of a truth observation. If there are fewer than 5 matches, the remaining match structures will be marked invalid by having all characters of the truth_type field NUL (zero).

The HDF-EOS Matchup_Info swath will contain the dimensions in Table 3:

Table 3. HDF-EOS Matchup-Info Swath Dimensions

| <i>Name</i> | <i>Value</i> | <i>Explanation</i> |
|---------------------|---------------|--|
| GeoTrack | # of profiles | The total number of AIRS-suite profiles (golfballs) contained in the file (same as for all other swaths) |
| MaxMatch | 5 | Maximum number of truth profiles matched to one AIRS golfball |
| SubTrack3x3 | (TBD) 3 | Number of along-track spots per profile for small-spot swaths (L1B AIRS, VIS, HSB, GCMMatchup) |
| SubXTrack3x3 | 3 | Number of across-track spots per profile for small-spot swaths (L1B AIRS, VIS, HSB, GCMMatchup) |
| MaxString | 80 | Maximum number of characters in a string |
| LongString | 255 | Maximum number of characters for Truth_File_UR and Truth_File_Name |

The Matchup_Info swath will have geolocation fields Latitude, Longitude, Time with dimensions GeoTrack,MaxMatch.

For each match, the fields in Table 4 will be present. In the HDF-EOS Matchup_Info swath, each field below, except Truth_File_*, will have dimensions GeoTrack,MaxMatch (Truth_File_* have dimension GeoTrack) before the specified Extra Dimensions.

Table 4. HDF-EOS Matchup_Info Swath Fields

| <i>Name</i> | <i>Type</i> | <i>Extra Dimensions</i> | <i>Explanation</i> |
|----------------------------------|----------------------------|-------------------------|---|
| <i>delta_sec</i> | 32-bit integer | None | Time difference (in seconds) between taking of truth data and AIRS-suite observations. Positive for AIRS data taken first. -99999999 for unknown |
| <i>dist_amsu</i> | 32-bit floating point | None | Distance (km) between location of AMSU-A observations & of truth. |
| <i>Truth_File_Type</i> | String of 8-bit characters | MaxString (=80) | This item contains the type of truth file being matched. It must always exactly match one of these valids: PREPQC.ADPUPA ADP upper air radiosonde records from PREPQC. This is the only valid value under operational circumstances at GDAAC. ARM/CART ARM/CART site (TBD) Surface Marine records. NONE No truth file. OTHER Other. |
| <i>Truth_File_Name</i> | String of 8-bit characters | LongString (=255) | This item contains the filename of the file matched. When Truth_File_Type= NONE or OTHER, this field can contain the identity of the originator of this request or information about the purpose of this experiment. Maximum: 255 characters |
| <i>Truth_File_UR</i> | String of 8-bit characters | LongString (=255) | This is the Universal Reference (UR) for the file named in Truth_File_Name=. It is ignored when Truth_File_Type= NONE. |
| <i>Truth_File_Version</i> | String of 8-bit characters | MaxString (=80) | This is the TBD versioning information about the truth file. It is ignored when Truth_File_Type= NONE. |
| <i>Truth_Type</i> | String of 8-bit | MaxString (=80) | String uniquely identifying truth profile type. For files |

| | | | |
|--------------------------|----------------------------|-----------------|--|
| | characters | | <p>with Truth_File_Type PREPQC.ADPUPA, Truth_Type contains a string of the form TYP:typ,T29:t29,ITP:itp where typ, t29, and itp are replaced by the values of these Table B entries:</p> <p>TYP: OI/SSI REPORT TYPE T29: NMC OFFICE NOTE 29 REPORT TYPE ITP: INSTRUMENT TYPE</p> <p>Other values will be designated for other types of truth. All characters NUL (0) denote no matchup present at this MaxMatch index.</p> |
| Profile_Id | String of 8-bit characters | MaxString (=80) | String uniquely identifying truth profile within the truth file. For PREPQC data this will be the SIDsid, where "sid" will be replaced by the SID from the PREPQC record. |
| Profile_Index | 32-bit integer | | Index uniquely identifying truth profile within the truth file. For PREPQC data this will be the SQN (TBD). |
| Quality_Indicator | String of 8-bit characters | MaxString (=80) | <p>Up to 80-character string indicating the quality of a given truth record. Definitions are:</p> <p>PREPQC.ADPUPA Number of levels at which this profile has valid temperatures.</p> <p>ARM/CART TBD</p> |

The GCML2 and GCMMatchup swaths will share the dimensions in Table 5.

Table 5. GCML2 and GCMMatchup Swath Dimensions

| <i>Name</i> | <i>Value</i> | <i>Explanation</i> |
|--|---------------|---|
| GeoTrack | # of profiles | The total number of AIRS-suite profiles (golfballs) contained in the file. (same as for all other swaths) |
| GCM_T_NLEV | 26 | The maximum number of temperature levels in GCM profile |
| GCM_H2O_NLEV | 21 | The maximum number of h2o levels in GCM profile |
| GCM_LW_NLEV | 21 | The maximum number of liquid water levels in GCM profile |
| GCM_OZO_NLEV | 6 | The maximum number of ozone levels in GCM profile |
| GCM_CLD_NLEV | 3 | The maximum number of cloud layers |
| GCM_NFileMax | 100 | The maximum number of GCM files needed to generate the swath |
| <i>In addition, the GCML2 swath will contain:</i> | | |
| SubTrack3x3 | 3 | Number of along-track spots per profile for small-spot swaths (L1B AIRS, VIS, HSB, GCMMatchup) |
| SubXTrack3x3 | 3 | Number of across-track spots per profile for small-spot swaths (L1B AIRS, VIS, HSB, GCMMatchup) |
| <i>And the GCMMatchup swath will contain:</i> | | |
| MaxMatch | 5 (TBD) | Maximum number of truth profiles matched to one AIRS golfball |

The GCML2 and GCMMatchup will have a common set of attributes, defined in Table 6.

For the following attributes: integer values are set to 0 and strings are set to " if
GCM_File_Number=0 or the index over file_number > GCM_File_Number. (file_number goes from 1 to GCM_NFileMax)

NCEP ON388 refers to NCEP Office Note 388, "GRIB, The WMO Format for the StorageProduct Information," 1998/03/10.

Table 6. GCML2 and GCMMatchup Common Attributes

| <i>Name</i> | <i>Type</i> | <i>Dimension</i> | <i>Explanation</i> |
|--------------------------|-----------------------|--------------------------------|---|
| GCM_Number_File | 32-bit integer | 1 | The number of GCM file processes in this run, must be smaller than GCM_NfileMax |
| GCM_File_Name | String | GCM_NfileMax (=100) | The names of the GCM files |
| GCM_Year | 32-bit integer | GCM_NfileMax (=100) | The year of the run of the GCM files |
| GCM_Month | 32-bit integer | GCM_NfileMax (=100) | The month of the run of the GCM files |
| GCM_Day | 32-bit integer | GCM_NfileMax (=100) | The day of the run of the GCM files |
| GCM_RunTime | 16-bit integer | GCM_NfileMax (=100) | The hour of the run of the GCM files, e.g., 0, 6, 12, 18 |
| GCM_Forecast_Time | 16-bit integer | GCM_NfileMax (=100) | The forecast time in hours from the run time, e.g., 0, 3, 6, 9... |
| GCM_Forecast_TAI | 64-bit floating-point | GCM_NfileMax (=100) | The forecast date and time as TAI93: floating-point seconds since start of 1993 |
| GCM_Center | String | 1 | The processing center for the GCM, (see Table 0 of NCEP ON388) values will include (may be expanded): NCEP ECMWF DAO |
| GCM_SubCenter | 16-bit integer | 1 | The division within the processing center, from GRIB PDS 26 (see Table C of NCEP ON388) |
| GCM_Process | 16-bit integer | 1 | Generating Process or Model, from GRIB PDS B6 (see Table A, NCEP ON388), nominally 96 for AVN forecasts/analyses |
| GCM_GridType | 16-bit integer | 1 | Grid ID of output (GRIB PDS B7, see Table 7, NCEP |

| | | |
|--------------------------|-----------------------|---|
| | | ON388), nominally 3 for global AVN forecast/analysis |
| <i>P_Temp</i> | 32-bit floating-point | Pressure levels of the GCM temperature profiles (hPa) |
| <i>P_H2O</i> | 32-bit floating-point | Pressure levels of the GCM water vapor profiles (hPa) |
| <i>P_Ozone</i> | 32-bit floating-point | Pressure levels of the GCM ozone profiles (hPa) |
| <i>P_CloudH2O</i> | 32-bit floating-point | Pressure levels of the GCM cloud water profiles (hPa) |

The GCML2 swath will contain one state for each AIRS footprint, therefore it is dimensioned (GeoTrack, SubTrack3x3, SubXTrack3x3). Fields are dimensioned (GeoTrack, SubTrack3x3, SubXTrack3x3, Dim), where Dim is listed in Table 7.

The GCMMatchup swath will contain one state per matchup, dimensioned (GeoTrack, MaxMatch). Fields are dimensioned (GeoTrack, MaxMatch, Dim), where Dim is listed in Table 7 (Dimensions of 1 are ignored.).

Table 7 defines the fields in a state.

Table 7. State Fields

| <i>Name</i> | <i>Type</i> | <i>Dimension</i> | <i>Explanation</i> |
|-------------------------------|-----------------------|------------------|--|
| <i>Location_Source</i> | 16-bit integer | 1 | The location type to which the GCM is interpolated: 1=AIRS, 2=V/NIR, 3=HSB, 4=AMSU, -1=N/A. Only for GCML2, not GCMMatchup |
| <i>P_surf</i> | 32-bit floating-point | 1 | The surface pressure (hPa) |
| <i>P_sealvl</i> | 32-bit floating-point | 1 | The sea level surface pressure (hPa) |
| <i>Ice_Cover</i> | 16-bit floating-point | 1 | Fractional coverage of ice from spatial interpolation of ice flag |
| <i>Land_Flag</i> | 16-bit floating-point | 1 | Fractional amount of land from spatial interpolation of land flag |
| <i>T_surf</i> | 32-bit floating-point | 1 | The surface skin temperature (K) |
| <i>H_surf</i> | 32-bit floating-point | 1 | The surface elevation (m) |
| <i>Albedo_surf</i> | 32-bit floating-point | 1 | The surface visible albedo (%) |

| | | | |
|----------------------------|-----------------------|--------------------|---|
| <i>T_surf_air</i> | 32-bit floating-point | 1 | The surface air temperature (K) |
| <i>Soil_water</i> | 32-bit floating-point | 1 | Volumetric fraction of soil moisture |
| <i>h2o_surf_mmr</i> | 32-bit floating-point | 1 | The surface water mass mixing ratio |
| <i>Total_Ozone</i> | 32-bit floating-point | 1 | Total Ozone (Dobson) |
| <i>Water_burden</i> | 32-bit floating-point | 1 | Precipitable water (kg/m ²) |
| <i>U_10</i> | 32-bit floating-point | 1 | The zonal wind speed 10m above surface (m/s) |
| <i>V_10</i> | 32-bit floating-point | 1 | The meridional wind speed 10m above surface (m/s) |
| <i>T_AIR</i> | 32-bit floating-point | GCM_T_NLEV (=26) | The air temperature profile (K) |
| <i>H2O_mmr</i> | 32-bit floating-point | GCM_H2O_NLEV (=21) | The water vapor mass mixing ratio profile |
| <i>Cloud_water</i> | 32-bit floating-point | GCM_LW_NLEV (=21) | The cloud liquid water mass mixing ratio in gm/kg, negative if cloud ice |
| <i>Ozo_vmr</i> | 32-bit floating-point | GCM_OZO_NLEV (=6) | The ozone volume mixing ratio profile |
| <i>CldFrac</i> | 32-bit floating-point | GCM_CLD_NLEV (=3) | The cloud fraction for each layer, 0 if clouds are absent (0-1). This is the total cloud fraction and not the viewed fraction observed by AIRS. |
| <i>Pcldtop</i> | 32-bit floating-point | GCM_CLD_NLEV (=3) | The cloud top pressure (hPa) |
| <i>Pcldbot</i> | 32-bit floating-point | GCM_CLD_NLEV (=3) | The cloud bottom pressure (hPa) |

States are interpolated to the locations of Matchup and AIRS footprints, using linear interpolation in time, bilinear interpolation in latitude and longitude. Flags are set to one if any of the corners are 1, e.g., there might be ice or land contamination.

GCM fields for time interpolation are from the same run and do not include the analysis, i.e., we use the 3, 6 and 9 hour forecasts, but never the 0 hour forecast.

The above fields are set to Bad_Float (-9999.0) or Bad_Integer (-9999) if bounding forecasts are unavailable. Bounding forecasts are separated by 3 hours and bracket the time of the footprint, or matchup.

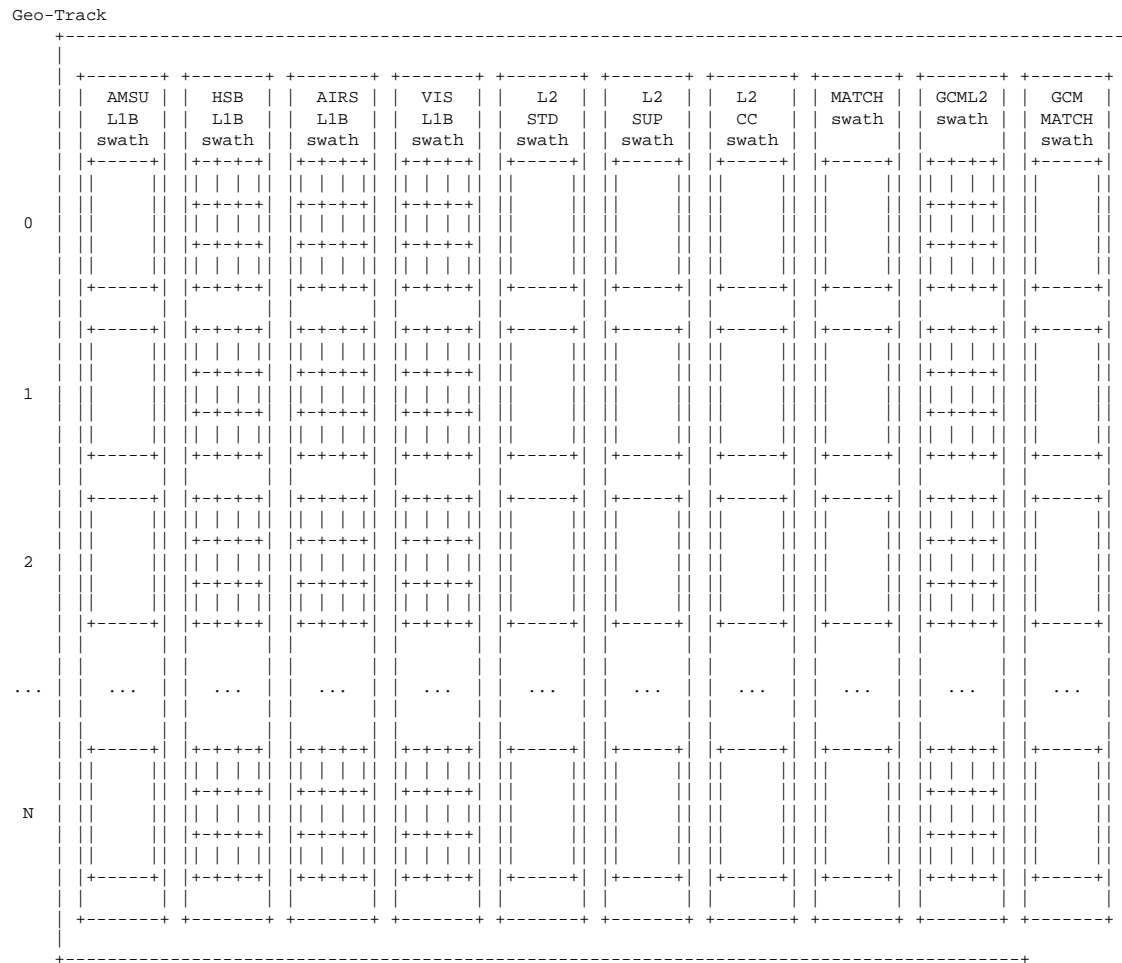


Figure 5. Conceptual Layout of Matchup File

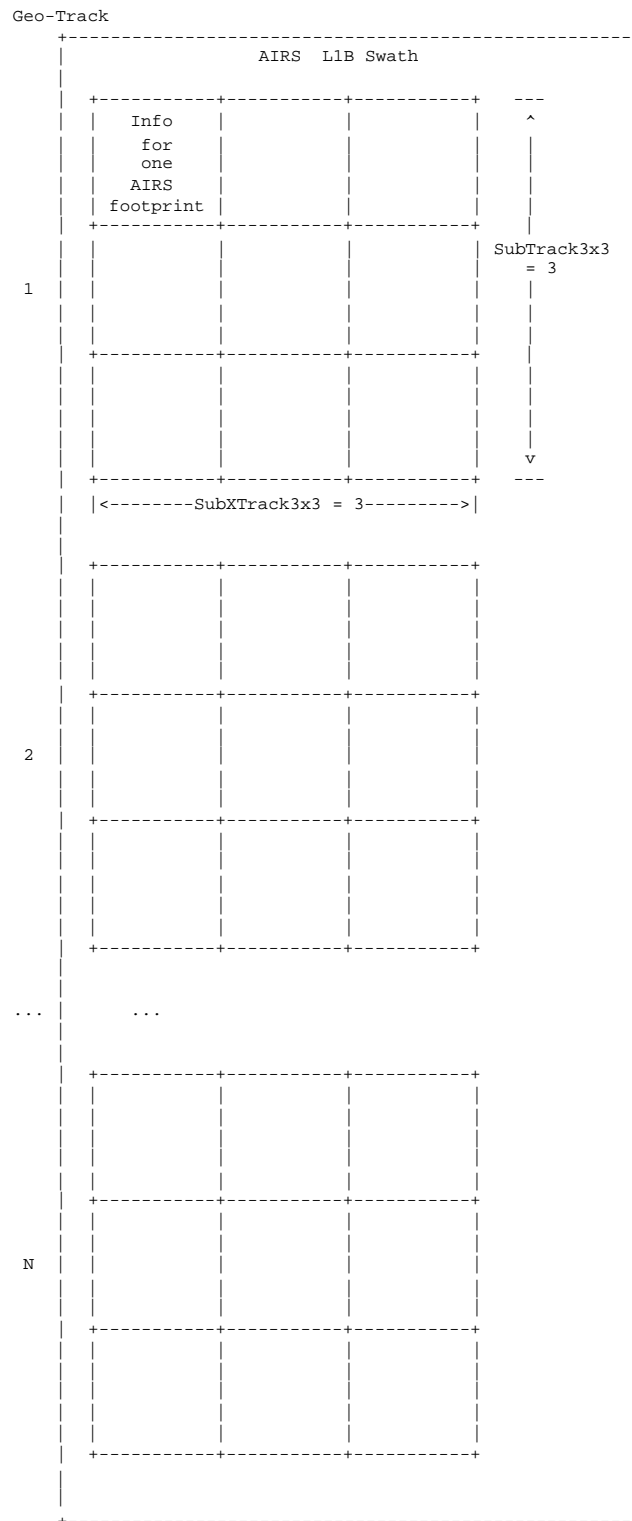


Figure 6. Closeup of AIRS L1B Swath, HSB L1B Swath, GCML2

Appendix A6. Visible Surface Map Product Interface Specification

The daily visible surface map product (AIRVBVID) represents the best estimation of global surface properties based on one day's observations. Because of clouds, this map will always have many gaps.

The multiday visible surface map product (AIRVBVIM) combines many days' observations (currently 10) into a single map.

Each Vismap product file consists of one array of 8-byte integers. The array forms a two-dimensional global map of the Earth's surface at 1-km resolution, using the Interrupted Goode Homolosine projection. (See Steinwand 1994, Int. J. Rem Sensing 15, 3463-3471, for a description of this projection. The paper is also available on the web at <http://edcdaac.usgs.gov/1KM/goodesarticle.html>.) It is identical to the format used by the 1-km AVHRR Project.

The array major dimension is line number, running from 1 to 17347. The array minor dimension is sample number, from 1 to 40031. Thus, the first 40031 values in the file represent the first line of data. Line number 1 corresponds to the northernmost parts of the map (the "top"). Sample 1 corresponds to the westernmost parts of the map (the "left"). An increment in line or sample number roughly corresponds to a 1-km shift on the surface of the Earth.

Each element has a value between 0 and 200, and is a rescaled version of the Normalized Differential Vegetation Index, or NDVI, which is a real number between -1.0 and 1.0. The relation between mapped parameter and NDVI is:

$$\text{map} = (\text{NDVI} * 100) + 100$$

Large map values (>140) correspond to heavily vegetated surfaces, while values below 110 are typically barren (including water).

Values of NDVI less than 4 do not correspond to the above equation but, instead, flag the following special circumstances:

- 0 = Bright desert
- 1 = Ocean
- 2 = Interrupted area (map element does not have corresponding location on Earth)
- 3 = Missing data

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Appendix B. AIRS Filename and Local Granule ID (LGID) Convention

AIRS filenames correspond to the "identifier" portion of the ECS Local Granule ID (LGID) standard:

LGID:shortname:version:identifier

where:

":" is a colon that acts as a separator of the parts of the LGID

"LGID" is a literal string

"shortname" is the ECS ESDT shortname

"version" is the ECS ESDT version

"identifier" is

AIRS.yyyy.mm.dd.ggg.Lev.Instr_Prod.vm.m.r.b.lvid.Fttttttttt.ext

as detailed below

We'll use identifiers of:

AIRS.yyyy.mm.dd.ggg.Lev.Instr_Prod.vm.m.r.b.lvid.Fttttttttt.ext

Making the whole LGID:

LGID:shortname:version:AIRS.yyyy.mm.dd.ggg.Lev.Instr_Prod.vm.m.r.b.lvid.Fttttttttt.ext

where:

AIRS is the literal string "AIRS" to identify this as
an AIRS-instrument-suite product.

yyyy.mm.dd is the year/month/day of the start of the granule.

Note: yyyy.mm.dd is the date of which T00Z is the start for
T00Z.L*.Match_RaObs, T00Z.Loc_RaObs, and T00Z.GStat_RaObs files.

Note: yyyy.mm.dd is start of last day specified for VegMapxxX

ggg is the granule number in day (001 - 240).

Note: Granule number is replaced by synoptic time for Match_xxxx
& GStat_xxxx & Loc_xxxx files that are RaObs,
Synop, or ARM. It is omitted for all other Match_xxxx &
GStat_xxxx & Loc_xxxx. It should always be one of
T00Z, T06Z, T12Z, T18Z for RaObs files.

Note: Granule number is omitted for daily products.
For browse products (L1B.Browse_AMSU, L1B.Browse_HSB,
L1B.Browse_AIRS, L2.Browse_Ret, L2.Browse_CC,
L2.DailyRetSum). It is replaced
by a single-character node-type identifier:
"A" for Ascending
"D" for Descending
For other daily products (L1B.VegMap, L1B.VegMapxxX, other
Match_xxxx, GStat_xxxx, and Loc_xxxx, Sum_xxxx)
there is no replacement.

Note: The numbering system from 001 - 240 is closely tied to the idea of 6-minute granules triggered at precise intervals keyed to total elapsed time since start of year 1958. Test granules have been produced with granule numbers outside of this interval or with granule numbers in range but without the corresponding start and end times. These granules are not supported for GDAAC or TDS usage.

Lev is processing level:

"L1A", "L1B", "L2", or "L3"

Note: special level "L1BMW" is used for Match_xxxx files with only L1B microwave information.

Note: no level is used for Loc_xxx files.

Instr is instrument name:

"AMSU" for AMSU-A

"HSB" for HSB

"VIS" for Vis channels of AIRS when there is a separate Vis product

"AIRS" for AIRS/IR *or* AIRS/IR + AIRS/Vis

Missing for Daily & L2 products.

Includes prefix "Sum_" for summary products "Sum_AIRS_Eng",

"Sum_AMSU", "Sum_HSB", "Sum_AIRS", "Sum_VIS".

Prod is descriptor of product:

For L1A:

"Scene" for scene footprints

"Calib" for calibration footprints

"HREng" for high-rate engineering

"EngStat" for engineering statistics

"QaSub" for QA subset

"Sum_AIRS_Eng" (includes "Instr") for daily AIRS engineering summary.

Omitted for AMSU & HSB, where each has only one L1A product.

For L1B:

"Rad" for science radiances (including MW instruments
where radiances are in units of brightness temperature)

"QaSub" for QA subsets

"BrSub" for browse subset

"QaSup" for QA support products (TLSCF only.)

"VegMap" for daily vegetation map

"VegMap"xx"X" for multiday vegetation map (xx is number of days
used to make this map 01-99: currently fixed at 10)

"Browse_AIRS", "Browse_AMSU", and "Browse_HSB" (includes "Instr")
for daily browse packages

"Sum_AMSU", "Sum_HSB", "Sum_AIRS", "Sum_VIS" (includes "Instr")
for L1B daily summary products

For L2:

"CC" for cloud-cleared AIRS radiances

"RetStd" for standard retrieval product

- "RetSup" for support retrieval product
- "RetQa" for retrieval QA Support product (TLSCF only.)
- "RetGStat" for Granule-level retrieval statistics (TLSCF only.)
- "RetBrSub" for retrieval browse subset
- "CCBrSub" for cloud-cleared browse subset
- "Browse_Ret" for daily retrieval browse packages
- "Browse_CC" for cloud-cleared daily browse packages
- "DailyRetSum" for daily retrieval browse summary

Files that can be L1B, L1BMW, or L2:

- "Match_xxxx" for Truth matchup file
- "GStat_xxxx" for Granule statistics from L2 reprocessing of truth matchup files (must be L2)

where xxxx is a truth type descriptor:

- "RaObs" for Radiosonde (PREPQCH)
- "Dynam_yyy" for dynamic sets of locations
- "Fixed_yyy" for fixed sets of locations
- "Synop_yyy" for synoptic sets of locations at a given synoptic time

where yyy is the source type variant

Files with no associated level:

- "Loc_xxxx" for Truth location file

where xxxx is as for Match_xxxx

c is a single-character source version code, present only for Loc_xxx and Match_xxx files.

vm.m.r.b is the PGEVersion uniquely identifying a configuration of source code + static ancillary files. "v" is the literal character 'v'. It is followed by four numbers separated by three "."s. These are the major & minor version numbers, a release number, and a build number. Example: "v2.5.12.45" is the 45th build of release 12 of version 2.5.

lvid is the LocalVersionID. This field is optional and usually absent.

Note: LocalVersionID is not included when the processing facility is "A" or "G"

F is processing facility ID:

- "G" for GSFC DAAC
- "A" for AIRS TLSCF official TDS processing
- "T" for AIRS TLSCF official testing
- "S" for AIRS TLSCF officially sanctioned simulation
- "D" for any direct broadcast station
- "N" for NOAA NESDIS
- "X" for anything else

ttttttttt is AIRS run tag (000000000000 - 999999999999).

This field is designed to ensure LocalGranuleIDs are unique, even when the same software is used to reprocess the same data. It is local processing time as yyyydoyhhmmss. (year, day-of-year (julian day), hour, minute, second).

Note: this corresponds to PSA AIRSRunTag.

ext is the filetype extension:

" .hdf" for all HDF products (including HDF-EOS)

" .text" for all text products

" .bin" for raw binary files (not standard products)

Note: when optional fields are absent only one "." appears, never two in a row.

Trailing "."s are also omitted.

Here's a full set (one of each type) as currently defined:

Produced by Level-1A PGEs:

AIRS.2001.12.03.131.L1A.AMSU.v2.12.5.4.A2002123120634.hdf
AIRS.2001.12.03.131.L1A.HSB.v2.12.5.4.A2002123120634.hdf
AIRS.2001.12.03.131.L1A.AIRS_Scene.v2.12.5.4.A2002123120634.hdf
AIRS.2001.12.03.131.L1A.AIRS_Calib.v2.12.5.4.A2002123120634.hdf
AIRS.2001.12.03.131.L1A.AIRS_QaSub.v2.12.5.4.A2002123120634.hdf
AIRS.2001.12.03.131.L1A.AIRS_HREng.v2.12.5.4.A2002123120634.hdf
AIRS.2001.12.03.131.L1A.AIRS_EngStat.v2.12.5.4.A2002123120634.hdf
AIRS.2001.12.03.131.L1A.VIS_Scene.v2.12.5.4.A2002123120634.hdf
AIRS.2001.12.03.131.L1A.VIS_Calib.v2.12.5.4.A2002123120634.hdf

Produced by Level-1B PGEs:

AIRS.2001.12.03.131.L1B.AMSU_Rad.v2.12.5.4.A2002123120634.hdf
(AIRS.2001.12.03.131.L1B.AMSU_QaSup.v2.12.5.4.A2002123120634.hdf)
AIRS.2001.12.03.131.L1B.HSB_Rad.v2.12.5.4.A2002123120634.hdf
(AIRS.2001.12.03.131.L1B.HSB_QaSup.v2.12.5.4.A2002123120634.hdf)
AIRS.2001.12.03.131.L1B.AIRS_Rad.v2.12.5.4.A2002123120634.hdf
AIRS.2001.12.03.131.L1B.AIRS_QaSub.v2.12.5.4.A2002123120634.hdf
AIRS.2001.12.03.131.L1B.AIRS_BrSub.v2.12.5.4.A2002123120634.hdf
AIRS.2001.12.03.131.L1B.VIS_Rad.v2.12.5.4.A2002123120634.hdf
AIRS.2001.12.03.131.L1B.VIS_QaSub.v2.12.5.4.A2002123120634.hdf

Produced by Level-1B Summary Browse PGEs:

AIRS.2001.12.03.A.L1B.Browse_AMSU.v2.12.5.4.A2002123120634.hdf
AIRS.2001.12.03.A.L1B.Browse_HSB.v2.12.5.4.A2002123120634.hdf
AIRS.2001.12.03.A.L1B.Browse_AIRS.v2.12.5.4.A2002123120634.hdf

Produced by Vis Level-1B surface Map PGEs:

AIRS.2001.12.03.L1B.VegMap.v2.12.5.4.A2002123120634.hdf
AIRS.2001.12.03.L1B.VegMap10X.v2.12.5.4.A2002123120634.hdf

Produced by Level-2 Retrieval PGEs:

AIRS.2001.12.03.131.L2.CC.v2.12.5.4.A2002123120634.hdf
AIRS.2001.12.03.131.L2.RetStd.v2.12.5.4.A2002123120634.hdf
AIRS.2001.12.03.131.L2.RetSup.v2.12.5.4.A2002123120634.hdf
AIRS.2001.12.03.131.L2.RetBrSub.v2.12.5.4.A2002123120634.hdf
AIRS.2001.12.03.131.L2.CCBrSub.v2.12.5.4.A2002123120634.hdf
(AIRS.2001.12.03.131.L2.RetQa.v2.12.5.4.A2002123120634.bin)
(AIRS.2001.12.03.131.L2.RetGStat.v2.12.5.4.A2002123120634.text)

Truth location files:

(AIRS.2001.12.03.T12Z.Loc_RaObs.a.v2.12.5.4.A2002123120634.text)
(AIRS.2001.12.02.Loc_Dynam_SurfMar.a.v2.12.5.4.A2002123120634.text)
(AIRS.2001.12.03.T13Z.Loc_ARM_NSA.a.v2.12.5.4.A2002123120634.text)

Produced by Match Truth & Level-2 matchup Truth PGEs:

AIRS.2001.12.03.T12Z.L2.Match_RaObs.a.v2.12.5.4.A2002123120634.hdf
(AIRS.2001.12.03.T12Z.L2.GStat_RaObs.a.v2.12.5.4.A2002123120634.text)
(AIRS.2001.12.03.T12Z.L1B.Match_RaObs.a.v2.12.5.4.A2002123120634.hdf)
(AIRS.2001.12.03.T12Z.L1BMW.Match_RaObs.a.v2.12.5.4.A2002123120634.hdf)
(AIRS.2001.12.02.L2.Match_Dynam_SurfMar.a.v2.12.5.4.A2002123120634.hdf)
(AIRS.2001.12.02.L2.GStat_Dynam_SurfMar.a.v2.12.5.4.A2002123120634.text)
(AIRS.2001.12.03.L2.Match_Fixed_ACAR.a.v2.12.5.4.A2002123120634.hdf)
(AIRS.2001.12.03.L2.GStat_Fixed_ACAR.a.v2.12.5.4.A2002123120634.text)
(AIRS.2001.12.03.T18Z.L2.Match_Synop_NPole.a.v2.12.5.4.A2002123120634.hdf)
(AIRS.2001.12.03.T18Z.L2.GStat_Synop_NPole.a.v2.12.5.4.A2002123120634.text))

Produced by Level-2 Summary Browse PGEs:

AIRS.2001.12.03.A.L2.DailyRetSum.v2.12.5.4.A2002123120634.hdf
AIRS.2001.12.03.A.L2.Browse_Ret.v2.12.5.4.A2002123120634.hdf
AIRS.2001.12.03.A.L2.Browse_CC.v2.12.5.4.A2002123120634.hdf

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Appendix C-1. AIRS Products

| ESDT Short Name | Sample File Name (Local Granule ID) | PCF LID | Instr. | Usage | File Size Per Granule (MB) | Files Per Day | Daily Rate (MB per Day) | Description |
|-----------------|---|---------|--------|---------------------------------------|----------------------------|---------------|-------------------------|---|
| AIRHASCII | AIRS.2000.12.15.001.L1A.HSB.v2.2.3.33.X02108051026 | 7122 | HSB | L1A Product Output, L1B Product Input | 1.0 | 240 | 247.2 | HSB L1A Science Footprints-HDF: HSB geolocated counts for scene footprints |
| AIRAASCII | AIRS.2000.12.15.001.L1A.AMSU.v2.2.3.33.X02108050537 | 7120 | AMSU-A | L1A Product Output, L1B Product Input | 0.2 | 240 | 50.4 | AMSU-A L1A Science Footprints-HDF: AMSU-A1 & AMSU-A2 combined, geolocated counts for scene footprints |
| AIRIASCI | AIRS.2000.12.15.001.L1A.AIRS_Scene.v2.2.3.33.X02108052348 | 7121 | AIRS | L1A Product Output, L1B Product Input | 58.7 | 240 | 14089.7 | AIRS L1A Science Footprints-HDF: AIRS infrared geolocated counts for scene footprints |
| AIRVASCI | AIRS.2000.12.15.001.L1A.VIS_Scene.v2.2.3.33.X02108052348 | 7123 | AIRS | L1A Product Output, L1B Product Input | 9.5 | 240 | 2273.9 | VIS L1A Science Footprints-HDF: AIRS visible geolocated counts for scene footprints |

| | | | | | | | | |
|----------|---|------|------|---|-----|-----|-------|---|
| AIRIACAL | AIRS.2000.12.15.001.L1A.AIRS_Calib.v2.2.3.33.X02108052348 | 7111 | AIRS | L1A Product Output, L1B Product Input | 3.9 | 240 | 934.2 | AIRS L1A Calibration Footprints-HDF: AIRS IR counts for space, blackbody, spectral cal. & photometric cal. sources including engineering data for calibration |
| AIRVACAL | AIRS.2000.12.15.001.L1A.VIS_Calib.v2.2.3.33.X02108052348 | 7113 | AIRS | L1A Product Output, L1B Product Input | 0.5 | 240 | 120.5 | VIS L1A Calibration Footprints-HDF: AIRS visible counts for space, blackbody, spectral cal. & photometric cal. sources including engineering data for calibration |
| AIRBAQAP | AIRS.2000.12.15.001.L1A.AIRS_QaSub.v2.2.3.33.X02108052348 | 7140 | AIRS | L1A AIRS/VIS QA Output | 0.5 | 240 | 114.1 | L1A AIRS/VIS QA Product |
| AIRIAHRE | AIRS.2000.12.15.001.L1A.AIRS_HREng.v2.2.3.33.X02108052348 | 7130 | AIRS | AIRS/VIS High-Rate Engineering Archival Product | 1.0 | 240 | 239.1 | AIRS/VIS High-Rate Engineering Archival Product |
| AIRIAHRS | AIRS.2000.12.15.001.L1A.AIRS_EngStat.v2.2.3.33.X02108052348 | 7131 | AIRS | AIRS/VIS Engineering Statistics Product | 0.2 | 240 | 44.0 | AIRS/VIS Engineering Statistics Product |

| | | | | | | | | |
|----------|---|----------------------------|--------|--|-----|-----|-------|--|
| AIRHBRAD | AIRS.2000.12.15.001.L1B.HSB_Rad.v2.2.3.33.X02108051208 | 6302, 6312 & 7212 | HSB | L1B Product Output, L2 Product Input, RaObs PGE Input, HSB Daily Browse PGE Input | 1.4 | 240 | 334.3 | HSB L1B Radiances-HDF: HSB geolocated & calibrated brightness temp. in Kelvin |
| AIRHBQAP | AIRS.2000.12.15.001.L1B.HSB_QaSup.v2.2.3.33.X02108051208 | 7252 | HSB | L1B Optional Product Output | 1.9 | 240 | 450.8 | HSB QA Support Product for debugging |
| AIRABRAD | AIRS.2000.12.15.001.L1B.AMSU_Rad.v2.2.3.33.X02108050637 | 6300, 6310 & 7210 | AMSU-A | L1B Product Output, L2 Product Input, RaObs PGE Input, AMSU Daily Browse PGE Input | 0.3 | 240 | 75.2 | AMSU-A L1B Radiances-HDF: AMSU-A1 & AMSU-A2 combined, geolocated & calibrated brightness temp. in Kelvin |
| AIRABQAP | AIRS.2000.12.15.001.L1B.AMSU_QaSup.v2.2.3.33.X02108050637 | 7250 | AMSU-A | L1B Optional Product Output | 0.7 | 240 | 163.9 | AMSU QA Support Product for debugging |

| | | | | | | | | |
|----------|---|-------------------|------|--|-------|-----|---------|--|
| AIRIBRAD | AIRS.2000.12.15.001.L1B.AIRS_Rad.v2.2.3.33.X02108054232 | 6211 & 7211 | AIRS | L1B Product Output, L2 Product Input, RaObs PGE Input | 121.1 | 240 | 29073.7 | AIRS L1B Radiances-HDF: AIRS IR Geolocated Radiances in Watts/cm**2/micron/steradian |
| AIRIBCBS | AIRS.2000.12.15.001.L1B.AIRS_BrSub.v2.2.3.33.X02108054232 | 7241 | AIRS | AIRS L1B Browse Subset, AIRS Daily Browse PGE Input | 0.6 | 240 | 151.7 | AIRS L1B Browse Subset |
| AIRIBQAP | AIRS.2000.12.15.001.L1B.AIRS_QaSub.v2.2.3.33.X02108054232 | 7251 | AIRS | AIRS L1B QA Product Output | 5.5 | 240 | 1323.8 | AIRS L1B QA Product Output |
| AIRVBRAD | AIRS.2000.12.15.001.L1B.VIS_Rad.v2.2.3.33.X02108053937 | 7213 | AIRS | L1B Product Output, L2 Product Input, RaObs PGE Input, VIS One-Day Surface PGE Input | 16.6 | 240 | 3987.9 | VIS L1B Radiances-HDF: VIS Geolocated Radiances in Watts/cm**2/micron/steradian |
| AIRVBQAP | AIRS.2000.12.15.001.L1B.VIS_QaSub.v2.2.3.33.X02108053937 | 7253 | AIRS | VIS L1B QA Product Output | 0.9 | 240 | 225.1 | VIS L1B QA Product Output |

| | | | | | | | | |
|----------|--|------|------|--|------|-----|--------|--|
| AIRX2RET | AIRS.2000.12.15.001.L2.RetStd.v2.2.3.33.X02108055444 | 7300 | AIRS | L2 Product Output, RaObs PGE Input | 4.6 | 240 | 1114.3 | AIRS L2 Standard Retrieval Product |
| AIRI2CCF | AIRS.2000.12.15.001.L2.CC.v2.2.3.33.X02108055444 | 7301 | AIRS | L2 Product Output, RaObs PGE Input | 25.8 | 240 | 6190.7 | AIRS L2 Cloud-Cleared Radiance Product |
| AIRX2SUP | AIRS.2000.12.15.001.L2.RetSup.v2.2.3.33.X02108055444 | 7302 | AIRS | L2 Product Output, RaObs PGE Input | 17.6 | 240 | 4228.5 | AIRS L2 Support Product |
| AIRX2RBS | AIRS.2000.12.15.001.L2.RetBrSub.v2.2.3.33.X02108055444 | 7310 | AIRS | L2 Product Output, L2 Ret Product Daily Browse PGE Input | 0.1 | 240 | 22.0 | AIRS L2 Retrieval Browse Subset Product |
| AIRI2CBS | AIRS.2000.12.15.001.L2.CCBrSub.v2.2.3.33.X02108055444 | 7311 | AIRS | L2 Product Output, L2 CC Radiance Daily Browse PGE Input | 0.1 | 240 | 16.9 | AIRS L2 Cloud-Cleared Radiance Browse Subset Product |
| AIRX2QAP | AIRS.2000.12.15.001.L2.RetQa.v2.2.0.89.X02108055444 | 7303 | AIRS | L2 Product Output | 2.8 | 240 | 683.0 | AIRS L2 QA Support Product |
| AIRXGSTA | L2-RetGStat | 8301 | AIRS | L2 Product Output | 0.25 | 240 | 6.0 | Granule Statistics versus Truth |

| | | | | | | | | |
|----------|---|------|--------|--|---------|---|------|--|
| AIRX2LOC | AIRS.2000.12.15.T18Z.Loc_RaOb.a.v2.2.0.57.X02108055444 | 7402 | RaObs | RaObs Tempora ry File | Various | 4 | 0.5 | Truth Location File |
| AIRX2MAT | AIRS.2000.12.15.T18Z.L2.Match_RaOb.a.v2.2.0.57.X02108055444 | 7401 | | RaObs PGE Output | 1000 | 4 | 4000 | Matchups of radiances, retrievals, and radiosondes - runs 4 times per day in overlapping runs |
| AIRHBDBR | AIRS.2000.12.15.A.L1B.Browse_HSB.v2.2.3.33.X02108051352 | 7263 | HSB | HSB Daily Browse PGE Output | 0.3 | 2 | 0.6 | HSB Daily Browse Package - Ascending & Descending |
| AIRABDBR | AIRS.2000.12.15.A.L1B.Browse_AMSU.v2.2.3.33.X02108050955 | 7261 | AMSU-A | AMSU-A Daily Browse PGE Output | 0.6 | 2 | 1.2 | AMSU-A Daily Browse Package - Ascending & Descending |
| AIRIBDBR | AIRS.2000.12.15.A.L1B.Browse_AIRS.v2.2.3.33.X02108054749 | 7262 | AIRS | AIRS Daily Browse PGE Output | 0.4 | 2 | 0.8 | AIRS Daily Browse Package - Ascending & Descending |
| AIRX2DBR | AIRS.2000.12.15.A.L2.Browse_Ret.v2.2.3.33.X02108061810 | 7320 | AIRS | L2 Retrieve d Product Daily Browse PGE Output | 0.5 | 2 | 1.0 | L2 Retrieval Daily Browse Package - Ascending & Descending |

| | | | | | | | | |
|----------|---|------|------|---|------|---|------|---|
| AIRX2ASD | AIRS.2000.12.15.A.L2.DailyRetSum.v2.2.3.33.X02108061810 | 7322 | AIRS | L2 Retrieve d Product Daily Browse PGE Output | 11.5 | 2 | 23.0 | L2 Browse Summary Data - Ascending & Descending |
| AIRI2DBR | AIRS.2000.12.15.A.L2.Browse_CC.v2.2.3.33.X02108061724 | 7321 | AIRS | L2 Cloud-Cleared Radiance Daily Browse PGE Output | 0.4 | 2 | 0.8 | L2 Cloud-Cleared Radiance Daily Browse Package - Ascending & Descending |
| AIRVBVID | Daily Vegetation Map | 7500 | AIRS | Vis One-Day Surface PGE Output | 700 | 1 | 700 | Daily Vegetation Map; Processing proceeds when all input granules are available, or at least one input granule is available and 48 hours have passed since the time of latest observation. AIRVBVID is an archive-only product, archived but available to external users. See AIRS Production Rules. |
| AIRVBVIM | Multi-day Vegetation Map | 7501 | AIRS | Vis Multi-Day Surface PGE Output | 700 | 1 | 700 | Multi-Day Vegetation Map; Processing proceeds when all input AIRSVBVIDs are available, or at least one input AIRSVBVID is available and 52 hours have passed since the time of latest observation. AIRVBIM is an archive-only product, archived but available to external users. See AIRS Production Rules. |

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Appendix C-2. AIRS Dynamic Inputs

| ESDT Short Name | Sample File Name (Local Granule ID) | PCF LID | Instr. | Usage | Daily Rate (MB per Day) | Description |
|-----------------|---|-------------|----------|---------------------------------|-------------------------|---|
| PM1EPHND | PM1EPHND#001040920021200000000001 | 10501 | | L1A Dynamic Ancillary Input | 6.0 | Definitive Spacecraft Ephemeris |
| PM1ATTNR | PM1ATTNR#001040920021200000000001 | 10502 | | L1A Dynamic Ancillary Input | 6.0 | Restituted Spacecraft Attitude |
| PMCO_HK | DAAC_INST_CARRYOUT-pm_1-epds-2002118005744-2002118010019-01.dmf | 4007 & 4008 | | L1A Dynamic Ancillary Input | 12.0 | Aqua housekeeping carryout file, including spacecraft & passive analog data |
| AIRH0ScE | P1540342AAAAAAAAAAAAAAAAA01264200000000.PDS | 342/9342 | HSB | L1A Product Input | 2.2 | APID 342/9342: All Science Data Packets collected by the HSB instrument during one scan period |
| AIR10XNM | P1540257AAAAAAAAAAAAAAAAA01264200000000.PDS | 257/9257 | AMSU - A | Special Case: L1A Product Input | [1.8] | Special Case: APID 257/9257 AMSU-A1 Science Data Packets - No Mode; substituted for APIDs 261 & 262 when instrument is in "No Mode" |
| AIRAACAL | P1540259AAAAAAAAAAAAAAAAA01264200000000.PDS | 259/9259 | AMSU - A | Special Case: L1A Product Input | [7.7] | Special Case: APID 259/9259 AMSU-A1 Science Data Packets - Staring Mode Packet 1; substituted for APID 261 when instrument is in "Staring Mode" |
| AIRASCAL | P1540260AAAAAAAAAAAAAAAAA01264200000000.PDS | 260/9260 | AMSU - A | Special Case: L1A Product Input | [5.4] | Special Case: APID 260/9260 AMSU-A1 Science Data Packets - Staring Mode Packet 2; substituted for APID 262 when instrument is in "Staring Mode" |

| | | | | | | |
|----------|--|------------|-------------|---|-------|---|
| AIR10SCC | P1540261AAAAAAAAAAAAAAAA01264200000000.PDS | 261 / 9261 | AMSU - A | L1A Product Input | 0.4 | AMSU-A1 Science Full-Scan #1 Packets APID 261/9261: AMSU-A1 Science Data Packets collected during one full scan of the instruments operating in Full-Scan Mode |
| AIR10SCI | P1540262AAAAAAAAAAAAAAAA01264200000000.PDS | 262 / 9262 | AMSU - A | L1A Product Input | 0.4 | AMSU-A1 Science Full-Scan #2 Packets APID 262/9262: AMSU-A1 Science Data Packets collected during one full scan of the instruments operating in Full-Scan Mode |
| AIR20XNM | P1540288AAAAAAAAAAAAAAAA01264200000000.PDS | 288 / 9288 | AMSU - A | Special Case: L1A Product Input | [1.1] | Special Case: APID 288/9288 AMSU-A2 Science Data Packets - No Mode |
| AIR20XSM | P1540289AAAAAAAAAAAAAAAA01264200000000.PDS | 289 / 9289 | AMSU - A | Special Case: L1A Product Input | [0.2] | Special Case: APID 289/9289 AMSU-A2 Science Data Packets - Staring Mode |
| AIR20SCI | P1540290AAAAAAAAAAAAAAAA01264200000000.PDS | 290 / 9290 | AMSU - A | L1A Product Input | 0.2 | APID 290/9290 AMSU-A2 Science Data Packets collected during one full scan of the instruments operating in Full- Scan Mode |
| AIRB0SCI | P1540404AAAAAAAAAAAAAAAA01264200000000.PDS | 404 / 9404 | AIRS | L1A Product Input | 624.9 | AIRS Scene Packets APID 404/9404: Each packet in this collection contains ground footprint data collected by the AIRS instrument for one footprint position. There are 90 of these packets for each scan of the AIRS instrument. |

| | | | | | | |
|----------|--|--|-------------------------------------|---|--|--|
| AIRB0CAL | P1540405AAAAAAAAAAAAAAAA01264200000000.PDS | 405/ 9405 | AIRS | L1A Product Input | 6.9 | AIRS Spacelook Packets APID 405/9405 |
| AIRB0CAH | P1540406AAAAAAAAAAAAAAAA01264200000000.PDS | 406/ 9406 | AIRS | L1A Product Input | 6.9 | AIRS Blackbody Packets APID 406/9406 |
| AIRB0CAP | P1540407AAAAAAAAAAAAAAAA01264200000000.PDS | 407/ 9407 | AIRS | L1A Product Input | 6.9 | AIRS Spectral/ Photometric Packets APID 407/9407 |
| AIRH1ENC | P1540414AAAAAAAAAAAAAAAA01264200000000.PDS | 414/ 9414 | AIRS | L1A Product Input | 6.9 | AIRS STD HR ENG #1 Packets APID 414/9414 |
| AIRH2ENC | P1540415AAAAAAAAAAAAAAAA01264200000000.PDS | 415/ 9415 | AIRS | L1A Product Input | 6.9 | AIRS STD HR ENG #2 Packets APID 415/9415 |
| AIRH1ENG | P1540416AAAAAAAAAAAAAAAA01264200000000.PDS | 416/ 9416 | AIRS | Special Case: L1A Product Input | [6.9] | Special Case: AIRS Flex HR ENG #2 Packets APID 416/9416; substituted for APID 414 when instrument is commanded to produce flexible engineering data |
| AIRH2ENG | P1540417AAAAAAAAAAAAAAAA01264200000000.PDS | 417/ 9417 | AIRS | Special Case: L1A Product Input | [6.9] | Special Case: AIRS Flex HR ENG #2 Packets APID 417/9417; substituted for APID 415 when instrument is commanded to produce flexible engineering data |
| AVI3_ANH | gblav.1998-09-12.T18Z.PGrbF03.anc | 2203, 2213, 2223, 2233 & 2243 | L2 Dynamic Ancillary Input | 328.0 | Aviation forecast from model; 2203, 2213, 2223, 2233 & 2243: 3-hour aviation forecast for 18Z-hour, 00Z-hour, 06Z- hour, 12Z-hour, 18Z-hour, respectively, cycle time on day prior to day in which granule starts | |

| | | | | | |
|----------|------------------------------------|--|--|-------|--|
| AVI6_ANH | gblav.1998-09-12.T18Z.PGrbF06.anc | 2206, 2216, 2226, 2236 & 2246 | L2 Dynamic Ancillary Input | 328.0 | Aviation forecast from model; 2206, 2216, 2226, 2236 & 2246: 6-hour aviation forecast for same model as 2203, 2213, 2223, 2233 & 2243, respectively |
| AVI9_ANH | gblav.1998-09-12.T18Z.PGrbF09.anc | 2209, 2219, 2229, 2239 & 2249 | L2 Dynamic Ancillary Input | 328.0 | Aviation forecast from model; 2209, 2219, 2229, 2239 & 2249: 9-hour aviation forecast for same model as 2203, 2213, 2223, 2233 & 2243, respectively |
| PREPQCH | L2.gdas1.980913.T00Z.BufPREPda.anc | 6400 | RaObs RaObs PGE Dynamic Ancillary Input | 12.0 | NOAA Radiosonde Observations |

Appendix C-3. AIRS Static Ancillary Inputs

| ESDT Short Name | Sample File Name (Local Granule ID) | PCF LID | Instr. | Usage | File Size (MB) | Description |
|-----------------|-------------------------------------|---------|--------|---------------------|----------------|---|
| AIRXADCM | L1A.decom_map_hsb.v1.1.0.anc | 4001 | | L1A Ancillary Input | 0.04 | Decom Map |
| AIRIARAN | L1A.eng_sumry_fds.v1.0.0.anc | 4011 | AIRS | L1A Ancillary Input | 0.03 | Limits for selected AIRS engineering parameters |
| AIRXACRV | L1A.tlm_calcurve_amsu.v1.1.1.anc | 4009 | | L1A Ancillary Input | 0.05 | Calibration conversion data numbers ranges |
| AIRXAPLY | L1A.tlm_polyconv_amsu.v1.1.0.anc | 4010 | | L1A Ancillary Input | 0.01 | Polynomial conversion constants |
| AIRXARYL | L1A.tlm_rylim_airs.v2.0.0.anc | 4005 | | L1A Ancillary Input | 0.60 | Red & Yellow Limits |
| AIRXAGEO | L1A.geolocation.v2.4.0.anc | 4006 | | L1A Ancillary Input | 0.01 | Geolocation Parameters |
| AIRHBPAR | L1B.HSB_AncMain.v2.0.0.anc | 3601 | HSB | L1B Ancillary Input | 0.01 | HSB calibration parameters |
| AIRHBSLC | L1B.HSB_SLCorr.v1.0.0.anc | 3602 | HSB | L1B Ancillary Input | 0.03 | HSB sidelobe correction matrices |
| AIRHBSLI | L1B.HSB_SLInterp.v2.0.0.anc | 3604 | HSB | L1B Ancillary Input | 0.01 | HSB cold sidelobe interpolation arrays |

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| AIRABPAR | L1B.AMSU_AncMain.v2.0.0.anc | 3501 | AMSU-A | L1B Ancillary Input | 0.01 | AMSU-A calibration parameters |
| AIRABSLC | L1B.AMSU_SLCorr.v1.0.0.anc | 3502 | AMSU-A | L1B Ancillary Input | 0.04 | AMSU-A sidelobe correction matrices |
| AIRABSLI | L1B.AMSU_SLInterp.v2.0.0.anc | 3504 | AMSU-A | L1B Ancillary Input | 0.04 | AMSU-A cold sidelobe interpolation arrays |
| AIRXBPAR | L1B.config_file1.v1.2.0.anc | 3005 | AIRS | L1B Ancillary Input | 0.06 | L1B Calibration parameters |
| AIRIBFRQ | L1B.airs_freq.v1.0.0.anc | 3006 | AIRS | L1B Ancillary Input | 0.02 | AIRS frequency list |
| AIRIBFPM | L1B.airs_focal_plane_map.v1.1.0.anc | 3007 | AIRS | L1B Ancillary Input | 0.001 | AIRS focal plane map |
| AIRIBSFF | L1B.spectral_feature.v1.2.0.anc | 3010 | AIRS | L1B Ancillary Input | 0.17 | AIRS spectral features |
| AIRIBNLC | L1B.non_linear_corr.v1.1.0.anc | 3011 | AIRS | L1B Ancillary Input | 0.09 | AIRS Non-linearity correction coefficients |
| AIRIBPOL | L1B.polarization_corr.v1.1.0.anc | 3012 | AIRS | L1B Ancillary Input | 0.04 | AIRS polarization correction coefficients |
| AIRIBSVS | L1B.space_view_sel.v1.0.0.anc | 3013 | AIRS | L1B Ancillary Input | 0.0007 | AIRS space view selection parameters |
| AIRIBPOP | L1B.popcorn_corr.v1.0.0.anc | 3014 | AIRS | L1B Ancillary Input | 0.01 | AIRS popcorn correction parameters |

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| AIRIBQPR | L1B.airs_qa.v1.3.0.anc | 3015 | AIRS | L1B Ancillary Input | 0.3 | AIRS QA parameters |
| AIRVBCPR | L1B.vis_param.v1.0.0.anc | 3009 | AIRS | L1B Ancillary Input | 0.003 | VIS calibration parameters |
| AIRVBQPR | L1B.vis_qa.v1.1.0.anc | 3016 | AIRS | L1B Ancillary Input | 0.01 | VIS QA parameters |
| AIRI2TMC | L2b.trcoef.airs.v5.1.0.anc | 2001 | AIRS | L2 Ancillary Input | 36.9 | AIRS IR Channel Transmittances |
| AIRA2TMC | L2.trcoef.amsu.v3.0.0.anc | 2002 | AMSU-A | L2 Ancillary Input | 0.13 | AMSU-A Transmittances |
| AIRH2TMC | L2.trcoef.hsb.v3.0.0.anc | 2003 | HSB | L2 Ancillary Input | 0.05 | HSB Transmittances |
| AIRX2CLI | L2.uars_clim.v1.0.1.anc | 2005 | | L2 Ancillary Input | 1.2 | Climatology to set initial guess profiles |
| AIRX2AAC | L2h.angle_adj_coef.v2.1.4.anc | 2006 | | L2 Ancillary Input | 40.9 | Angle Correction Coefficients |
| AIRX2AEI | L2.F.error_est.v1.0.0.anc | 2007 | | L2 Ancillary Input | 0.01 | Ancillary error estimate inputs |
| AIRX2ABT | L2h.brtemp_tuning_coef.v2.0.0.anc | 2008 | | L2 Ancillary Input | 29.4 | BRTemp Tuning Coefficients |
| AIRI2SRD | L2.airs_solar_rad.v5.1.0.anc | 2009 | AIRS | L2 Ancillary Input | 0.06 | Solar radiances |

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| AIRX2CAV | L2.cloud_avg.v2.0.0.anc | 2010 | | L2 Ancillary Input | 0.24 | Parameters determining channel averaging vs. extrapolation |
| AIRM2MEC | L2.M.ecof_705.v1.0.0.anc | 2011 | | L2 Ancillary Input | 0.004 | MW emissivity coefficients |
| AIRM2MCM | L2.M.cov100av.v1.0.0.anc | 2012 | | L2 Ancillary Input | 0.22 | MW temperature profile covariance matrix |
| AIRH2AAW | L2.M.weight.hsb.v1.0.0.anc | 2013 | HSB | L2 Ancillary Input | 0.003 | HSB ASCII Weight |
| AIRI2CHP | L2.l.channel_prop.v5.1.2.anc | 2014 | AIRS | L1B AIRS & L2 Ancillary Input | 0.21 | AIRS Channel properties |
| AIRI2OLR | L2h.F.coef_olr.v1.0.0.anc | 2015 | | L2 Ancillary Input | 0.06 | Outgoing longwave radiation coefficients |
| AIRX2ICW | L2.l.peak_wgt.v2.0.0.anc | 2021 | | L2 Ancillary Input | 0.17 | FIRST cloud clearing weighting function sensitivities |
| AIRX2MAS | L2.masuda.v1.0.0.anc | 2016 | | L2 Ancillary Input | 0.06 | Coefficients for Masuda model of ocean emissivities |
| AIRX2CTC | L2.l.cleartest_coef.v2.0.2.day.anc | 2054 & 2055 | | L2 Ancillary Input | 0.004 | Coefficients to predict AIRS radiance from AMSU-A |
| AIRI2FRQ | L2.l.clr.regcoef.v1.0.1.anc | 2056 & 2057 | | L2 Ancillary Input | 1.1 | Clear sky detection regression coefficients |
| AIRI2FEV | L2.l.eigvec_allang.solang.nf.v2.0.0.anc | 2041 & 2042 | AIRS | L2 Ancillary Input | 6.6 | FIRST retrieval first guess matrix of eigenvectors for nighttime footprints |

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| AIRI2FRD | L2.l.rcoef.solang.v2.0.0.anc | 2043 & 2044 | AIRS | L2 Ancillary Input | 0.6 | FIRST first guess principal component mode regression coeff daytime footprints |
| AIRI2IFC | L2.l.freq.eigvec.v2.0.0.anc | 2045 | AIRS | L2 Ancillary Input | 0.02 | FIRST retrieval first guess eigenvectors AIRS channels list |
| AIRX2ANG | L2.l.ang_pc.v2.0.0.anc | 2046 | | L2 Ancillary Input | 7.9 | Principle components for angle adjustment |
| AIRX2ICM | L2.l.airs_covmtx.v2.0.0.anc | 2051 | | L2 Ancillary Input | 0.6 | FIRST physical retrieval covariance matrix for L2 parameters |
| AIRX2ITC | L2.l.freq.tmp.ret.v2.0.0.anc | 2052 | AIRS & AMSU-A | L2 Ancillary Input | 0.001 | FIRST retrieval temperature channel list for AIRS and AMSU-A |
| AIRX2IWC | L2.l.freq.h2o.ret.v2.0.0.anc | 2053 | AIRS & HSB | L2 Ancillary Input | 0.001 | FIRST retrieval water channel list for AIRS and HSB |
| AIRX2NLD | L2_DEFAULTS100.v2.0.4.anc | 2061 | | L2 Ancillary Input | 0.01 | Namelist giving default values for L2 parameters |
| AIRV2PRM | L2.vis_nir.v2.0.0.anc | 2065 | AIRS | L2 Ancillary Input | 0.001 | V/NIR parameters |
| AIRHBMLC | BR.L1B.HSB_limb.v1.0.0.anc | 3703 | HSB | HSB Daily Browse PGE Ancillary Input | 0.01 | HSB L1B browse limb correction |
| AIRHBCTB | BR.L1B.HSB_hdf_color_tbl.v1.0.0.anc | 3705 | HSB | HSB Daily Browse PGE Ancillary Input | 0.001 | HSB L1B browse color table |
| AIRABMLN | BR.L1B.AMSU_limb_nosea.v1.0.0.anc | 3701 | AMSU-A | AMSU Daily Browse PGE Ancillary Input | 0.03 | AMSU L1B browse limb correction - no sea |

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| AIRABMLS | BR.L1B.AMSU_limb_sea.v1.0.0.anc | 3702 | AMSU-A | AMSU Daily Browse PGE Ancillary Input | 0.029 | AMSU L1B browse limb correction - sea |
| AIRABCTB | BR.L1B.AMSU_hdf_color_tbl.v1.0.0.anc | 3704 | AMSU-A | AMSU Daily Browse PGE Ancillary Input | 0.001 | AMSU L1B browse color table |
| AIRIBCTB | BR.L1B.AIRS_hdf_color_tbl.v1.0.0.anc | 3705 | AIRS | AIRS Daily Browse PGE Ancillary Input | 0.001 | AIRS L1B browse color table |
| AIRX2BCTB | BR.L2.RET_hdf_color_tbl.v1.0.0.anc | 2082 | AIRS | AIRS L2 Retrieved Product Daily Browse PGE Ancillary Input | 0.001 | AIRS L2 Retrieved Product browse color table |
| AIRI2BCTB | BR.L2.CC_hdf_color_tbl.v1.0.0.anc | 2081 | AIRS | AIRS L2 Retrieved Product Daily Browse PGE Ancillary Input | 0.001 | AIRS L2 Cloud-Cleared Radiance browse color table |
| AIRVBVIM | AVHRR_NDVI_Apr11to20_1993.v1.0.0.anc | 2301 - 2312 | AIRS | L2 Ancillary Input | 700 | Static monthly mean multiday surface visible maps, for use when no dynamic AIRVBVIM available |